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STEEL

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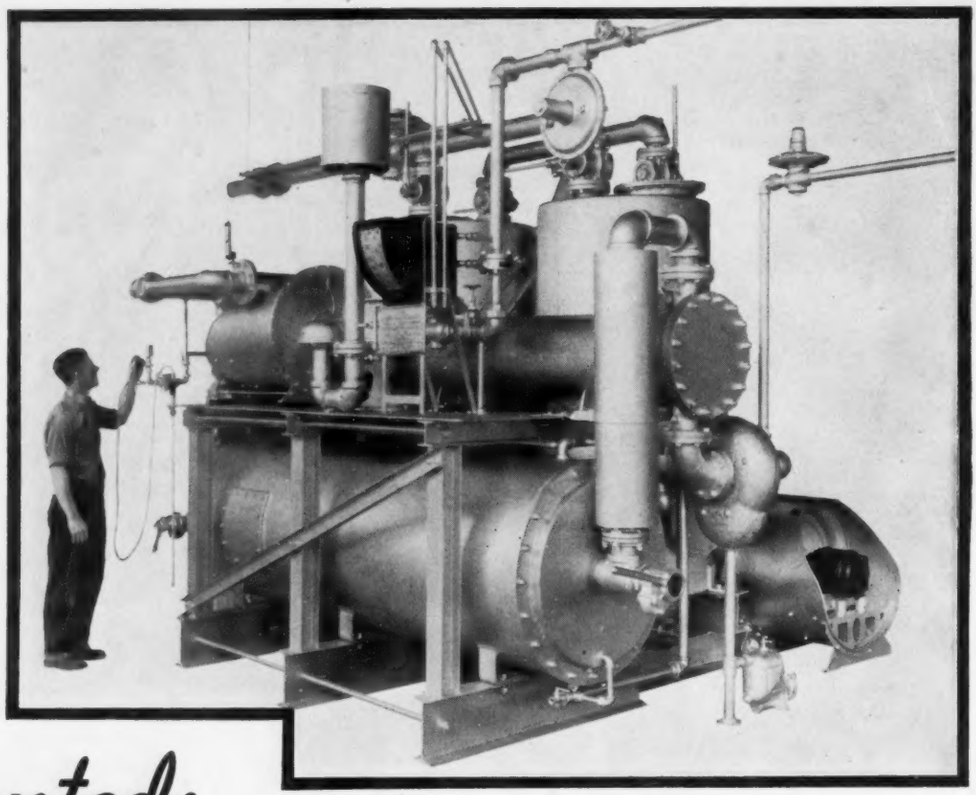
PRODUCTION · PROCESSING · DISTRIBUTION · USE

Kemp 8,000 C. F. H. Atmos-Gas Producer with twinned, activated alumina towers.



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We want to talk to the hair-splitters of the steel industry, men who can spot a blemish as far as they can see a stack of sheets . . because *we've got something* for them.

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KEMP of BALTIMORE

STEEL
PRODUCTION • PROCESSING • DISTRIBUTION • USE

As the Editor Views the News

■ THOUGH still headed up, the steelmaking rate is moving at a slower pace. This is due to delays in engaging the remaining capacity and to shutdowns for repairs. Enforced interruptions at open hearth furnaces last week held the gain (p. 30) to 2 points, bringing the rate to 89½ per cent of ingot capacity. Consumption is rising (p. 183) and many requirements have not yet been covered. Due to heavy commitments some producers of concrete reinforcing bars are trying to buy this product from competitors. Export orders for steel at attractive prices are being declined in most instances due to sold-up conditions of the mills. No first quarter price announcements yet have been made; as revealed by such adjustments as have been made of late, the trend is in the upward direction.

• • •

Responsible industrial leaders continue to reiterate (p. 39) their aversion to war, also the determination of industry to keep prices equitably related to costs.

Adverse To War

With war in Europe, with a high, mounting volume of business here, with living costs tending higher, growing concern is felt (p. 33) over the prospect in labor relations. With organized labor more powerful than ever before, strikes have been called in recent months at double the 1914 rate. Employers are advised to pay heed to their machinery for dealing with employes. Possibilities of the immediate future are revealed at Detroit (p. 41) where the right of management to determine production schedules in its own plants is an issue, taking the form of slowdowns in automobile production lines.

• • •

The aviation industry this year (p. 27) will spend approximately $15,000,000 to develop swifter and safer planes, more powerful and reliable engines. This

Aviation Research

makes no allowance for huge government financed expenditures toward the same objectives. . . . Bureau of mines (p. 39) has organized exploration parties to determine more accurately United States resources in tin, antimony, manganese, chromium and tungsten. . . . Sign of the times is the revival (p. 35) of long dormant quotations on shell steel. . . . Latest wonder in the automotive world (p. 42) is a stamping comprising front fender and shroud, hood side and headlamp all in one integral part. . . . Cost of industrial construction, says an authority (p. 45), has advanced 5 cents, to an average of $1.45 per average square foot.

• • •

STEEL presents another group of versatile new machines (p. 52) that were to have been exhibited at the canceled Machine Tool Show. They offer advan-

Versatile Machines

tages that can be utilized in many production lines. . . . Youngstown Sheet & Tube Co.'s new continuous hot and cold mills at Indiana Harbor (p. 56) incorporate interesting features. They increase greatly the capacity of the Chicago district. . . . A new process produces stainless spotwelds whose length (p. 63) is ten times the thickness of the sheets, and without sparking or burning; high electrode pressures and short welding periods are employed. Evaporator chambers so welded withstand internal pressures up to 600 pounds per square inch. . . . Available (p. 80) is a new acid-tight cement for use with acidproof brick.

• • •

The past year has brought great progress in the field of metals. This is reviewed pictorially and (pp. 108-159) in comments by 42 recognized authorities,

Progress In Metals

setting up a picture aimed at insuring full understanding of the values at the Metal Congress and Show to be held the week of Oct. 23 in Chicago. Many new developments to be revealed on this occasion have profound significance for the present and immediate future. . . . An authority (p. 54) clarifies certain fundamentals with respect to wire rope and its applications to modern equipment. . . . A wrought iron producer controls weight of metal in pouring by a photoelectric cell (p. 84) mounted on the scale beam. . . . Members of the American Gas association (p. 78) look for a continuance of business at a relatively high level.

E C Kreutzberg

Scene in Inland's modern annealing department

INLAND solves forming and deep drawing problems

Here in Inland's modern mills and sheet finishing departments, the ductility and temper of iron and steel sheets and strip undergo profound changes.

Here many difficult forming or deep drawing problems are solved. They are being solved for Inland customers every day. They can be solved for you.

Here the workability required for the deep drawing of a washing machine tub or bullet-type automobile fender, or the stiffness required of a door panel are bred into Inland sheets and strip by heat treatment.

Cut Down Spoilage Costs

Spoilage is prevented by knowing your exact requirements. For example, one manufacturer had resorted to spot annealing with a blow torch to prevent breakage when the edge of a deep-drawn receptacle was turned down in a later operation.

Since using Inland sheets specially annealed for his purpose, this operation has been entirely eliminated at considerable saving . . . and there has been practically no spoilage from the second forming operation.

Don't Overlook a Problem

His problem was solved through the call of an Inland metallurgist at his plant. The economy was unexpected. Such an opportunity may exist in your plant, too. An Inland metallurgist will gladly check the possibility with you or your shop men. There is no cost or obligation for his service.

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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

AIRCRAFT INDUSTRY SPEEDING UP *Development, Research* WORK

■ AVIATION'S new importance in today's war-minded world is spurring activity in the nation's air research and development laboratories.

Manufacturers, army and navy, federally-sponsored organizations and commercial airlines are expanding and accelerating their experimentation, striving for swifter and safer planes, more powerful and more reliable engines.

Builders of airplanes, motors and propellers this year will expend approximately $15,000,000 on the most ambitious development programs in their history. Nearly every leading firm is increasing its development facilities. Projects recently were announced by Hamilton Standard Propellers division of United Aircraft Corp., East Hartford, Conn.; Lockheed Aircraft Corp., Burbank, Calif.; Vultee Aircraft division of Aviation Mfg. Corp., Downey, Calif.; Allison Engineering division of General Motors, Indianapolis; and Continental Motors Corp., Muskegon, Mich.

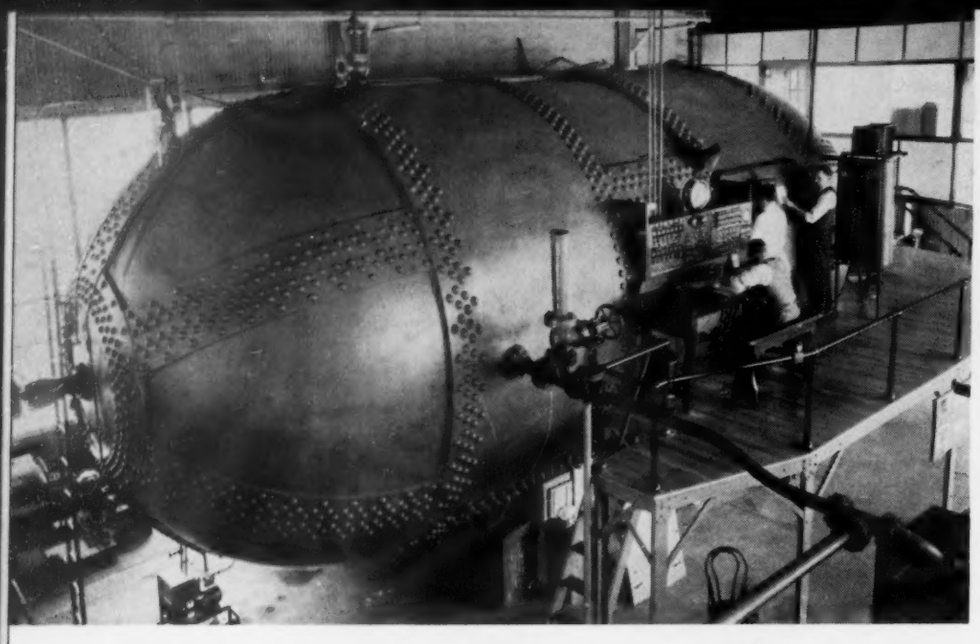
Peculiar to aviation is its extensive and costly experimental work. During the past five years, it is estimated by Aeronautical Chamber of Commerce of America, 37 major producers spent $44,000,000 for this purpose, or some 63 per cent more than aggregate net profits during that period.

While success in product improvement is attested by the nation's role as world's No. 1 air exporter, the United States of late has admittedly slipped behind in certain phases of aeronautical development. Germany, for instance, is said to be ahead in some respects. To regain and keep its former unchallenged technical supremacy is the domestic industry's present determination.

Trailblazers in aviation's phenomenal advance, researchers have been effecting constant change in design, discarding numerous engineering precedents, establishing new standards, putting to use new materials and methods.

Noticeable, however, is the indus-

■ **Unusual equipment in great variety is used by National Advisory Committee for Aeronautics at its Langley field, Va., research base. In this huge wind tunnel are studied air forces acting on a full-sized plane. Jet of tunnel is 30 feet high and 60 feet wide, its propeller creating a 120-mile per hour windstream. Findings here have boosted speeds as much as 35 miles per hour**



■ How air flows over wing sections is investigated at Langley field with a variable-density tunnel enclosed in this steel pressure tank. Compressing air up to 300 pounds per square inch tank can duplicate any pressure condition in actual flying

♦

try's present concentration on improving existing types, rather than on basic research involving the discovery and application of new fundamental knowledge.

Planemakers' development departments require a great variety of specially-designed equipment for investigating materials, structural design and production methods, and constructing models and prototypes.

Metallurgical Equipment Used

Typical needs comprise machines for testing tension, compression and torsion in metals; instruments for measuring stress, fatigue and creep; X-ray for examining physical qualities of cast and forged parts; equipment for metallurgical study; engine test rigs; and wind tunnels for models and full-sized planes.

Elaborate apparatus has been developed for measuring structural vibration and load-bearing qualities under simulated flying conditions.

Scope of the experimental departments maintained by larger producers is illustrated at Glenn L. Martin Co.'s plant. This firm's 500 technical specialists work in an individual four-story building at Middle River, Md. Provided with its own tools and equipment, staff is completely independent of production divisions.

In laboratories adjoining its Burbank, Calif., plant, Lockheed Aircraft has just installed considerable equipment. Included is a Southwark-Tate-Emery universal testing machine, used to determine strength factors of aircraft materials. Eighteen feet high, it has 300,000 pounds compression and tensile capacity.

Trying development problems confront engine builders in their quest for decreased weight and resistance, greater power, speed and reliability. No small feat is it to make even minor changes in a super-precise motor of some 700 parts. To perfect an entirely new engine may take three to five years, according to J Carlton Ward Jr., general manager United Aircraft's Pratt & Whitney division. During such development his firm often builds by hand and scraps a number of motors costing $50,000 or more.

How well engine designers are doing their work is demonstrated by the operating life of the product. Some American airplane engines give good service for as long as 5000 hours, or the equivalent at average speed of two round trips to the moon—a matter of nearly 1,000,000 miles. Recent achievements have been a new 24-cylinder, 2400-horsepower inline motor, and two 18-cylinder, 2000-horsepower models. Under a $60,900 war department grant, Wright Aeronautical Corp., Paterson, N. J., now is building a 42-cylinder experimental unit.

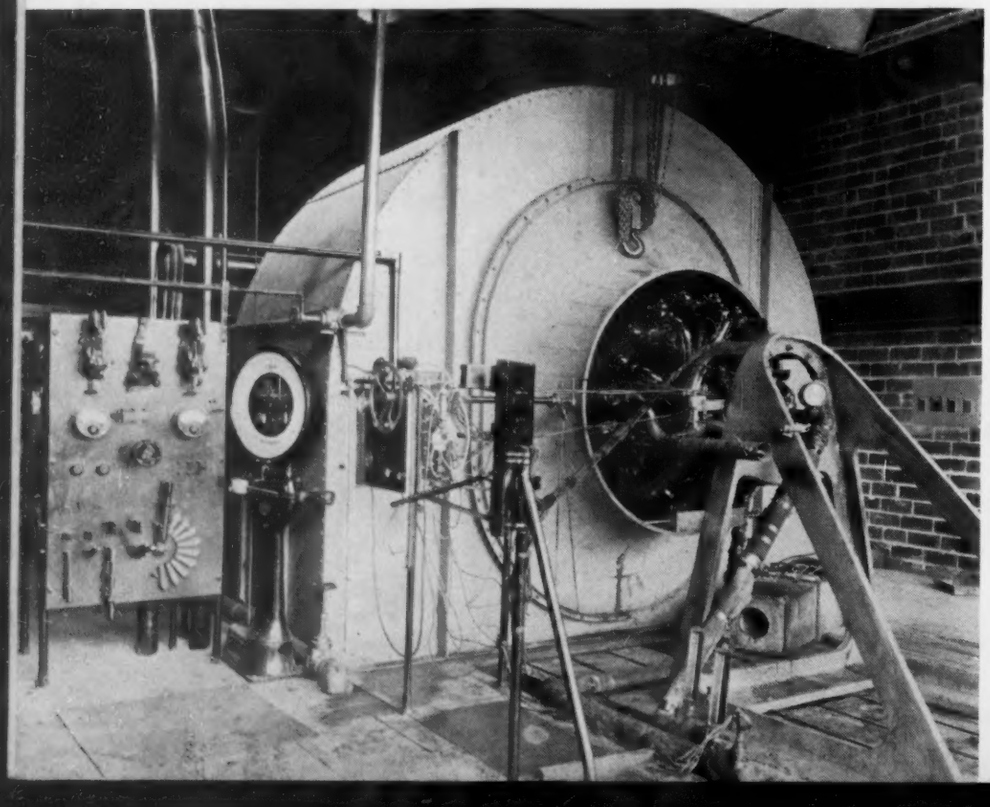
With army and navy engineers responsible for many technical milestones, military aviation has paced aeronautical progress. Virtually all plane and engine design today is influenced by military requirements.

Expanding Army's Facilities

Center of air corps engineering is Wright field, the *materiel* division's aircraft procurement, testing and development base at Dayton, O. Under a broad construction program now in progress its $10,000,000 experimental department is being supplemented by a new $4,500,000 laboratory.

What the air corps cannot buy in the way of airplanes or components it develops itself, subsequently issuing specifications to manufacturers and requesting bids. In this manner engineers at Wright field have figured directly or indirectly in vital military and commercial developments such as high-powered air-cooled engines; cabin and engine superchargers; high-octane fuels; vibration dampers; radio beacons; airway and airport lighting; welding of aircraft steels; hollow steel and forged aluminum propeller blades; retractable landing gear; and night-time aerial photography.

Numerous improvements in air-



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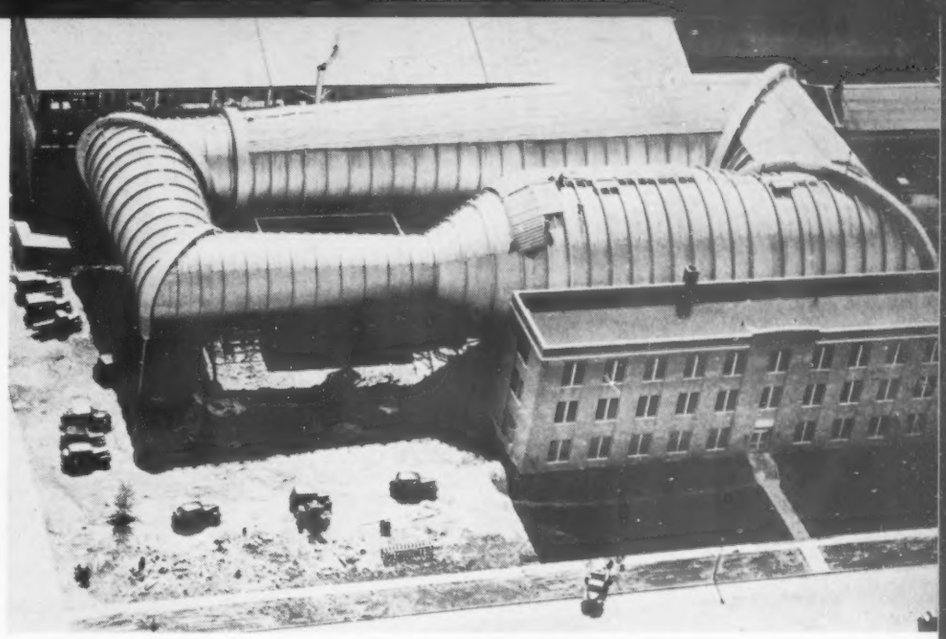
■ Testing a radial air-cooled engine in the dynamometer laboratory at Wright field, army's aircraft procurement and development center in Dayton, O. Currently under construction here is a new $4,500,000 experimental shop. Official photo, U. S. army air corps



■ Recently completed at Langley field research base by Pittsburgh-Des Moines Steel Co., Pittsburgh, was this 19-foot diameter variable-pressure wind tunnel, said to be largest of its kind in the world. Two years in the building, tunnel required 2000 tons of steel and a carload of welding wire for its all-welded construction

craft components first saw light here. Practical application of chrome-molybdenum alloys to airplane use was perfected at Wright field. A rubber substitute was developed which proved more durable and applicable for its purpose than the genuine. Now under study are aluminum, magnesium and beryllium base alloys, high melting point solders, and spot-welding of stainless steel and aluminum assemblies.

Air corps engineers are making significant progress in their current work with radio-controlled aircraft. Already they have perfected a small target plane which will perform any maneuver at altitudes up to 5000 feet while under ground direction.

Employ Every Modern Device

Comprising five branches—aircraft, power plant, equipment, materials and armament — Wright field's engineering laboratories are among the most complete in the world, containing every type of modern equipment. In use here are wind tunnels; static and dynamic testing equipment; world's largest propeller test rig, mounting units up to 45 feet in diameter; engine test stands; "cold rooms" for studying aircraft operation in low temperatures; 40-foot high torque testing stands; equipment for investigating fuels and structural materials.

Engineering and development facilities maintained for navy aeronautics now are being substantially expanded. Construction of a $1,800,000 laboratory already is underway at the Philadelphia naval aircraft factory. Contracts last week were awarded for a new engine test building costing $143,000 at the navy's Alameda, Calif., air base.

Prominent in research work is National Advisory Committee for Aeronautics, government agency established in 1915 to "supervise and direct the scientific study of the problems of flight."

This unit alone has spent more than $3,000,000 on research in the past five years. It now is preparing plans for a new laboratory at Sunnyvale, Calif., for which congress appropriated $10,000,000 during closing days of the last session.

In its present base at Langley field, Va., NACA has devised unusual equipment. In addition to huge steel wind tunnels and pressure tanks, it maintains well-equipped flight, engine and hydro-dynamics laboratories.

Recently completed here by Pittsburgh-Des Moines Steel Co., Pittsburgh, was a 19-foot diameter variable-pressure wind tunnel, said to be largest of its kind in the world. Two years in the building, tunnel took 2000 tons of steel. Its all-welded construction required a carload of welding wire.

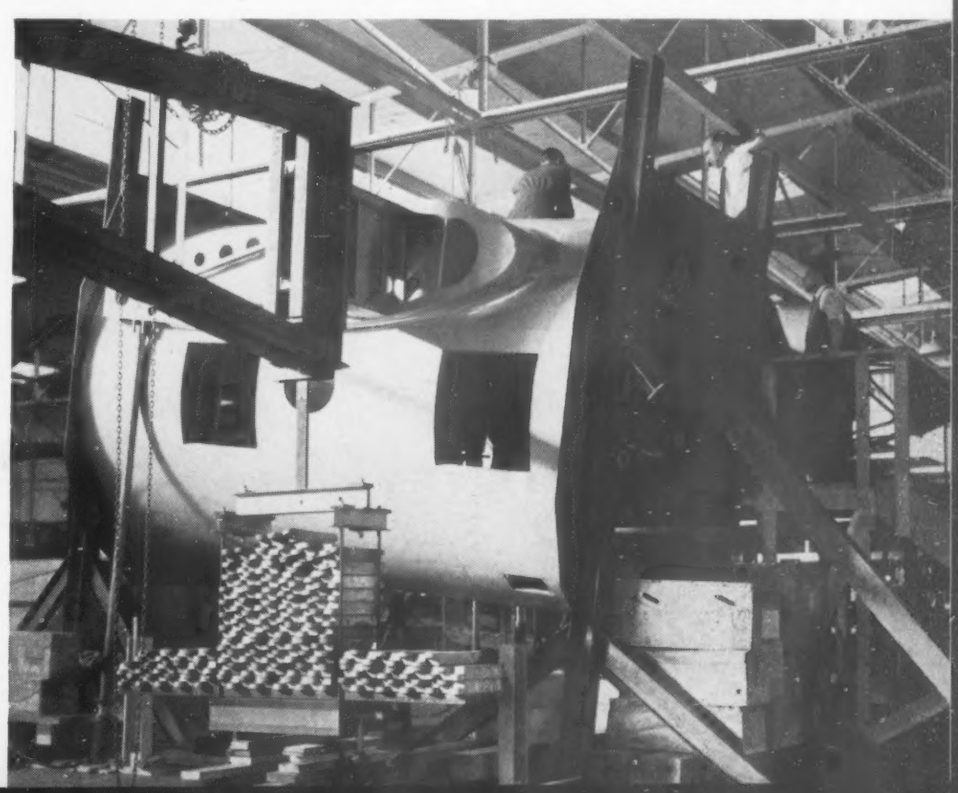
Another special unit just built at Langley field is a steel pressure sphere, 60 feet in diameter. In this engineers may observe the performance of scale-model aircraft under controlled atmospheric conditions.

Currently being studied at Langley field are such problems as the use of engine exhaust gases to prevent wing icing; attainment of 500-mile per hour speed; reduction of fire hazard by means of special fuels as well as new systems of fuel injection.

Gasoline savings from but one of its developments—the antidrag cowling for radial air-cooled engines—alone amount to more than the cost of all equipment at Langley field, NACA estimates.

Airlines in Engineering

Only lately have airlines engaged in their own engineering activities. Nearly all major carriers now are establishing such departments. Accent is on flying safety and passenger comfort. One important accomplishment by airline researchers recently was the development of a more efficient cabin heating system using a boiler of welded stainless



■ Steel superstructures, lead weights and hydraulic pressures are employed by Douglas Aircraft Co., Santa Monica, Calif., to test the strength of aluminum alloy fuselage sections for transport planes. Instruments accurately record deflections and stresses

steel to lengthen service life.

A most enterprising corps on America's technical front are its aeronautics laboratories, pouring forth innovations embracing physics, chemistry and metallurgy. To their unceasing search for improvements in airplane structures and manufacturing technique is due much of today's progress in alloy development and precision metalworking practice.

NEW INLAND FACTORIES UNDER DEFENSE PLANS

Need for augmenting aircraft production capacity in comparatively inaccessible inland areas, long-discussed under national defense plans, resulted last week in announcement by Aviation Mfg. Corp., New York, that it will build a new plant at Nashville, Tenn. Costing approximately $260,000, first units are to be completed within 90 days.

United Aircraft Corp. last week authorized a $1,000,000 expansion program for its Pratt & Whitney division, East Hartford, Conn. Involved is construction of a 274,000-square foot factory unit.

Equipment orders just placed by army air corps: Wright Aeronautical Corp., Paterson, N. J., radial engines, $6,963,292; and Hamilton Standard Propellers division of United Aircraft, East Hartford, Conn., propeller assemblies and controls, $964,596.

Lockheed Aircraft Corp., Burbank, Calif., last week booked from Mid-Continent Airlines a $250,000 order for three "Lodestar" commercial transport planes.

District Steel Rates

Percentage of Ingot Capacity Engaged In Leading Districts

	Week ended Oct. 14	Change	Same week 1938	Same week 1937
Pittsburgh	86	+ 3	40	60
Chicago	87.5	+ 1.5	45.5	57
Eastern Pa.	68	+ 4	32	51
Youngstown	94	+ 4	51	58
Wheeling	93	None	54	74
Cleveland	90	+ 1	56	68
Buffalo	88.5	+ 5	49	67.5
Birmingham	90	+ 4	57	70
New England	90	—10	70	70
Cincinnati	86	+ 2	70	70
St. Louis	74.5	+ 2.5	48.5	60
Detroit	98	— 2	77	92
Average	89.5	+ 2	51.5	63

PRODUCTION

■ STEEL ingot output increased 2 points last week to 89.5 per cent. Most districts shared in the advance, although in two areas the shutting down of open hearths for repairs caused reductions. In some districts the only steelmaking furnaces still idle are those being repaired. Last week's rate compares with 51.5 per cent a year ago and 63 per cent in the corresponding 1937 period.

Pittsburgh—Rose 3 points to 86 per cent and still gaining.

Chicago—Advanced 1.5 points to 87.5 per cent, highest in more than nine years. Four mills are at 100 per cent.

Central eastern seaboard — Expanded 4 points to 68 per cent. One mill has taken off a furnace but this was offset by gains elsewhere.

Youngstown — Increased 4 points to 94 per cent, with 20 blast furnaces, 72 open hearths and three bessemer furnaces operating. Repairs are being hurried to additional blast furnaces. An unchanged rate is indicated this week.

Wheeling—Steady at 93 per cent. A gain is forecast for this week.

Cleveland—Up 1 point to 90 per cent, representing capacity for all available furnaces.

Buffalo—Gained 5 points to 88.5 per cent. Lighting of two open-hearths was offset by closing of two others for repairs.

Birmingham—Rose 4 points to 90 per cent, with the relighting of the Fairfield foundry furnace by the Tennessee company.

New England—Declined 10 points to 90 per cent, the result of furnace repairs at Bridgeport, Conn.

Cincinnati—Increased 2 points to 86 per cent, with some plants at capacity.

St. Louis—Moved 2 points higher to 74.5 per cent.

Detroit — Off 2 points to 98 per cent. The reduction was occasioned by minor repairs to one furnace which was idle four days.

U. S. Steel Shipments Increase 22.5 Per Cent

■ Shipments of finished steel by United States Steel Corp. subsidiaries in September totaled 985,050 tons, or 22.5 per cent more than in August. Shipments for the first nine months were 6,858,427 tons, compared with 4,588,224 tons in the corresponding period of 1938, a gain of 49 per cent.

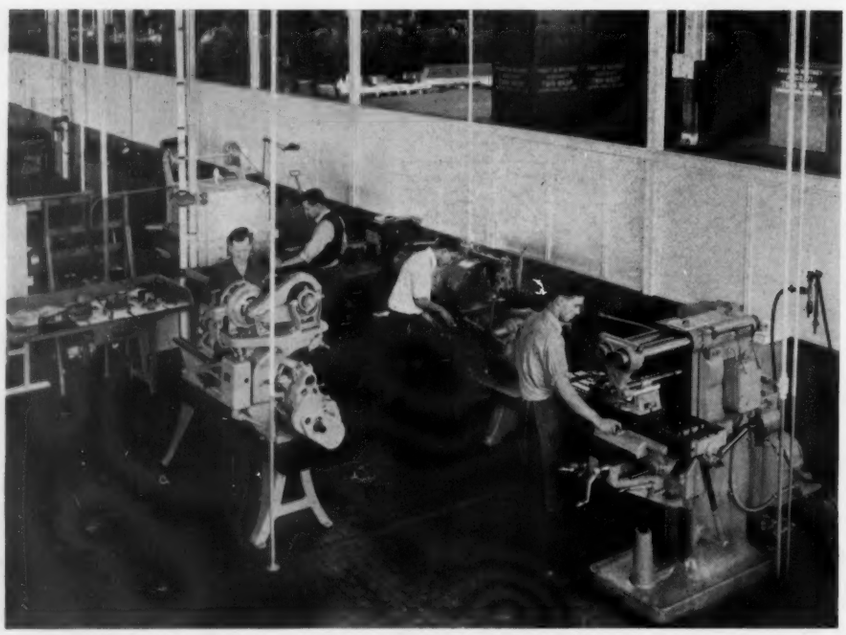
U. S. STEEL CORP. SHIPMENTS

(Inter-company shipments not included)
(Tons)

	1939	1938	1937	1936
Jan.	789,305	518,322	1,149,918	721,414
Feb.	677,994	474,723	1,133,724	676,315
March	767,910	572,199	1,414,399	783,552
April	701,459	501,972	1,343,644	979,907
May	723,165	465,081	1,304,039	984,097
June	733,433	478,057	1,268,550	886,065
July	676,309	441,570	1,186,752	950,851
Aug.	803,822	558,634	1,107,858	823,703
Sept.	985,050	577,666	1,047,962	961,803
Oct.	.....	663,287	792,310	1,007,417
Nov.	.....	679,653	587,241	882,643
Dec.	.....	694,204	489,070	1,067,365
Adj.*	.....	‡30,381	†77,113	†40,859
Total	.....	6,655,749	12,748,354	10,784,273

*Yearly adjustment. †Deduction. ‡Increase.

■ Railroads of the country will order or place in service not less than 60,000 new freight cars in 1939, M. J. Gormley, executive assistant of the Association of American Railroads, told Atlantic states shippers' advisory board in Newark, N. J., recently.



■ **Confronting particularly trying design problems, builders of today's high-speed, super-precise airplane engines require elaborate experimental facilities. Illustrated is a section of the complete machine shop in new development laboratory just constructed by Pratt & Whitney division of United Aircraft Corp., East Hartford, Conn.**

France Well Equipped with Materials; Germany Lacks Ore; Scrap a Problem

By VINCENT DELPORT
European Manager, STEEL

LONDON

■ FRANCE entered this war with all its ore and coal resources and iron and steel production facilities intact, and with a more complete and efficient plant than in 1914.

As in England, industry has been brought under state control. The shift to wartime organization was effected with a minimum of delay under a complete plan for industrial mobilization prepared years ago, when possibility of armed conflict first became apparent.

Imports and exports are controlled. Raw material imports for metallurgical industries are controlled by the ministry of commerce, under which various bodies have been organized to handle the different groups of materials and allocate them to consumers according to their requirements and to their commitments to the state.

Exports of iron ore, scrap and iron and steel products are forbidden except in special cases for which licenses must be obtained. France is naturally anxious to limit exports of vital goods and to stimulate exports of nonessential products. For this reason a system of rationing has been set up, and priority is given government requirements.

Government Controls Steel Prices

Every possible step has been taken to accelerate production. Emergency legislation has increased hours of work and provided for overtime. Necessary dispositions have been taken to assure fair wages.

Difficulties are certain to be experienced owing to the calling to colors of most able-bodied men and provision is being made in regard to highly skilled workers, some of whom must be available to handle modern war equipment, while others are required for special work in production plants.

Prices of iron and steel products, fixed by a government-controlled body, have not varied since war began. A general increase however, is expected before long.

■ This is the second article dealing with European steel and metalworking industries under war conditions. The first, by Mr. Delport, describing regulations in Great Britain appeared in STEEL, Oct. 9, p. 15

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In some respects the French iron and steel industry is somewhat more self-contained than that of Great Britain, and depends less on arrivals by sea. Ore supplies are plentiful and of the right sort for her iron production. French coal mines are productive and well-equipped, but coke supplies must be supplemented by imports. Of these Germany formerly shipped the greater part, but the national output can be intensified and imports from Belgium and Great Britain can be increased. Scrap must be preserved. Taking a general view, there is every reason to believe the French iron and steel industry is well-fitted to play its essential part in conduct of the war.

It is well known that Germany's iron and steel resources are considerable. Germany at this day is by far the largest iron and steel producer in Europe and her capacity is being increased by development of the state-owned Hermann Goering works. First of its nine blast furnaces, of 1000 tons daily capacity, was to be started at the end of September.

Germany is seriously handicapped, however, by her deficiency in iron ores. About two-thirds of her requirements have to be imported; or roughly 22,000,000 tons out of 33,000,000 tons in 1938. Fur-

French Garden Becomes Bomb-Proof Shelter

■ Steam shovels and trucks excavating famous Luxemburg gardens of the French senate, preparatory to construction of bomb-proof shelters. Many Parisian public squares and gardens have been similarly destroyed. NEA photo

thermore, German ores are of relatively low iron content and the methods employed to make use of these ores down to the poorest grades are characterized by high production costs and high consumption of coke.

Greater part of German ore imports formerly came from France and Sweden, followed by Spain and Spanish Morocco, Luxemburg, Norway, Newfoundland, Algeria and a few other less important sources. French supplies, including Algerian, are naturally entirely cut off as are those from Newfoundland. Arrivals from Spain and Spanish Morocco will be hampered by the blockade. These sources together supplied nearly 9,000,000 tons in 1938.

Thus the Reich must rely mainly on Swedish ores, increased imports from Yugoslavia, the relatively small amounts obtainable from other sources, and the ore beds captured from Moravia and Poland. The latter, however, will be required to supply the works for which they already were destined. Possibility of Russian supplies is highly problematical. It is notable that in the first three weeks of the war Britain captured 88,000 tons of iron ore and 44,000 tons of manganese ore destined for Germany, as reported by Winston Churchill to parliament.

Until hostilities began, Germany had sufficient coke to meet her own requirements and exported a surplus to Luxemburg and France. Exports to France, of course, are stopped, so there is no apparent deficiency at present, although larger quantities of coke will be needed to smelt poor ores. Here again, scrap is a problem, and it is probable there will not be enough, as imports, which make up about 10 per cent of requirements, will be reduced, and many domestic sources —domestic in the more homely sense—have already been virtually squeezed out.

Exports of iron and steel products are likely to be severely restricted, owing to certain markets being closed and to Germany's own requirements.

German Equipment Efficient

German steel-producing equipment is extensive and up-to-date. Even allowing for the partial loss of production in the Saar district, now on very brink of the front line, and for difficult working conditions in the works controlled in Bohemia, Moravia and Poland, the German steel industry remains a powerful and lasting asset to the country.

For the time being, Belgium and Luxemburg appear to be the only countries in Europe in a position to export iron and steel products, especially to overseas markets. Possibilities of their exporting, however, are considerably restricted due to necessity to increase their armaments, hampering of production by reduced imports of ore and coke, difficulties of transport and freight and confusion brought about by dislocation of the International Steel Entente. Most of their export business is now handled by the Belgian selling organization "Cosibel". Prices are quoted in Belgian francs at a level substantially higher than at the time war started, even slightly above the official basic prices quoted by the entente exporting countries at the begining of the year.

Chief difficulty facing the Belgian and Luxemburg steel industry is a limited supply of iron ore and coke. In 1938 the Belgo-Luxemburg economic unit imported over 9,000,000 tons of iron ore, of which 8,600,000 tons came from France. Imports of coke were nearly 2,000,000 tons, of which 1,500,000 came from Germany. Belgium exported about 600,000 tons of coke to France. Since the opening of hostilities these exchanges have stopped, and as a result, Belgian and Luxemburg iron and steelmakers have substantially reduced their output in order to preserve their resources of raw materials. Negotiations now are being conducted between Belgium, Luxemburg and France with a view to resumption, at least partially, of exchanges of iron ore and coke disrupted by the war.

European Export Trade Dislocated

Combined effect of these factors is that export trade on any large scale is practically halted, notwithstanding existing demand. A trickle of business is being done with Scandinavia and Holland, and deliveries of semifinished steel are being made to Great Britain, but not up to that country's requirements. Domestic trade in Belgium and Luxemburg also is hampered and large tonnages on order cannot be delivered. There is reason to believe, however, that through negotiations with other countries and the more intensive exploitation of resources, position of the Belgian and Luxemburg steel industry will improve.

Generally speaking, European export trade is dislocated, and all previous arrangements to regulate prices, supplies and deliveries have fallen out. The International Steel Entente, bed plate of such machinery, has broken up, the only close and permanent contacts remaining being those between the British and French steel industries. This means the subsidiary cartels of the entente, covering ingots, sheets, wire products and the like, also have come to an end. It is possible that when the situation is clarified, understanding between countries or groups of countries may bring some order into the present confusion.

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Aircraft Detector For Porto Rico

■ **Porto Rico sees its first aircraft detector as United States troops arrive to fortify the island. The sensitive instrument, with ponderous base, automatically finds the range for 3-inch antiaircraft guns**

Labor in Wartime, 1914 and 1939; Workers' Gains Vast in 25 Years

■ WILL war in Europe bring to American industry a new wave of labor difficulties such as experienced during the World war?

Outbreak of hostilities in 1914 found this country in a depression; the war's immediate effect was to paralyze and disorganize business. After the initial shock, business recovery was vastly stimulated by huge war orders from belligerents. Production expanded; prices and livings costs rose; wage structures became unbalanced; a labor shortage developed.

Labor became conscious of its new strategic position, determined to exploit its advantage to the limit. Strikes more than trebled from 1914 to 1917, and continued at high level throughout the war and the post-war reconstruction period. Hourly wage rates increased rapidly. Labor department statistics on strikes for the period:

Year	Number Strikes	Year	Number Strikes
1914	1204	1918	3353
1915	1593	1919	3630
1916	3789	1920	3411
1917	4450	1922	1112

Direct overall comparison of present conditions with those following 1914 would not be valid as the current situation is posed against a different background, possesses characteristics peculiar to itself. Certain basic factors, however, operate in any inflationary period, and recognition of these may point toward industry's labor problems during the war.

Conditions More Favorable

First, it should be pointed out that many conditions are more favorable for industrial peace than in 1914. Wages are incomparably higher, even when the increase in living costs is considered. Hourly rates in many cases have more than trebled. Iron and steel wages now average about 84 cents, compared with 26 cents in 1914. Foundry and machine shop rates have increased from an average of 27½ cents to 74 cents; automobile workers are receiving 96 cents as compared with 29 cents in 1914.

Collective bargaining now is generally accepted. Employers have gained in experience in dealing with labor. Working conditions are better. The 8-hour day and 40-hour week have become practically standard.

Comprehensive machinery for hearing and adjusting employes' grievances have been set up, and is working well in many plants, both unionized and open shop.

A more discriminating public is reacting to labor's excesses of 1937 and will be an influence for reason. The pendulum of opinion has swung back from the extreme left, where labor was given everything it asked for, to a more critical center.

Union Membership Doubled

Let it not be assumed that this progress, encouraging through it may be, is sufficient to prevent recurrence of wholesale labor controversies. Today the strike situation is much worse than in 1914. Recent monthly figures show strikes are being called this year at twice the 1914 rate, and the trend has been increasing gradually since January. Union membership more than doubled from 1914 to 1938.

Organized labor has been given great liberties by statute and these have been transformed into license through the interpretation and administration by government authorities biased toward labor.

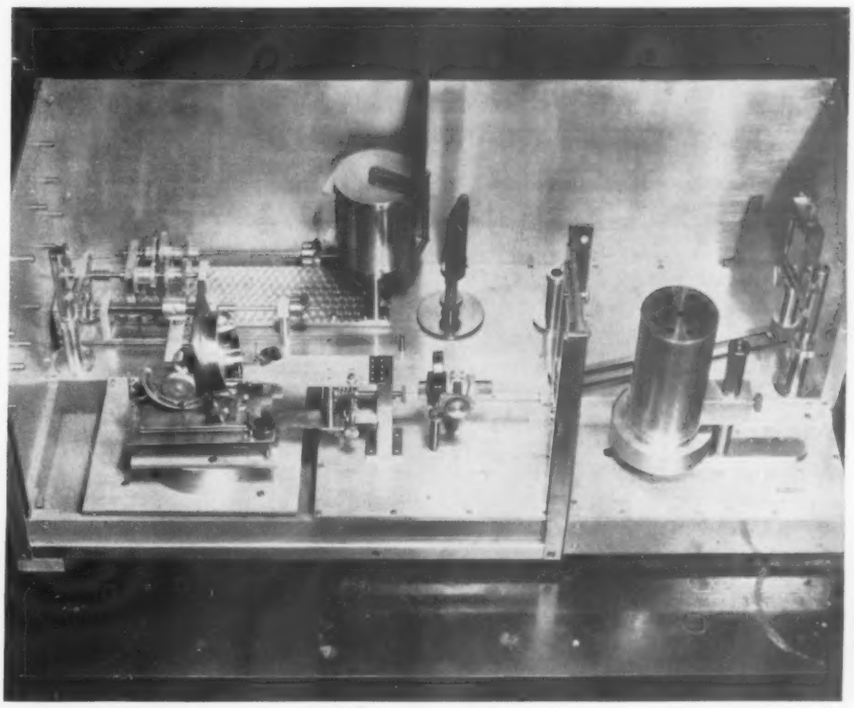
The responsibility of many labor leaders has not yet been demonstrated and experiences of the past several years indicate organizers will exploit immediately any situation advantageous to them.

While there is little likelihood of a general labor shortage unless the United States is drawn into the war, a scarcity of skilled workers already has been felt. This particularly is true of special machine tool operators, lathe operators, molders, patternmakers, diemakers, all-around machinists, assemblers and erectors, boring machine operators and grinders. A shortage of other skilled labor is anticipated if present conditions continue.

A labor shortage would give workers the same advantage they had during the World war, when employers were forced to bid up wages to obtain necessary men. Iron and steel wages, according to National Industrial Conference board figures, rose from an average of 26 cents in July, 1914, to a peak of 73½ cents in November 1920, during the post-war reconstruction. Common wage rates rose from 20½ cents to 58½ cents during the same period. Foundry and machine shop wages rose from 27½ cents to 64¼ cents; automobile plant rates from 29 cents to 72 cents; farm implements from 26½ cents to 73 cents.

That war conditions in industry

Measures to Millionths of an Inch



■ **Importance now attached to surface quality of precision parts produced commercially in quantities is emphasized by this "profilograph," shown in process of testing finish on inner race of tapered roller bearing. Through delicate system of levers and mirrors, a tiny beam of light is made to indicate degree of smoothness to millionths of an inch**

will renew pressure for wage increases already has been demonstrated in several industries. Textile and automobile workers are demanding widespread blanket wage increases. Reductions necessitated by the 1938 depression in some cases are being restored and in scattered instances new wage increases have been granted.

To avoid recurrence of the World war labor disorders, industrial relations counselors are advising employers to pay heed to their machinery for dealing with employes. Although industry is in a much better position to avoid strikes than was the case at the World war's outbreak, there remains a great latent danger of costly disruption of production.

To prevent such losses as occurred during the last war, industry considers that it must perfect its systems for adjusting grievances and bargaining with employes; it must guard against lack of balance in wage structures; enlist the aid of public opinion to insist that whatever regulations be imposed bear fairly on employer and employe alike; remain aware of the latent dangers in the present situation and see that from the start causes of labor trouble are not allowed to develop.

Wage-Hour Law Changes Oct. 24 To Affect Iron, Steel Only Slightly

■ STEPPING up requirements of the fair labor standards act (wages and hours) Oct. 24 will necessitate only minor adjustments in the iron and steel industry.

Minimum wage required after Oct. 24 will be 30 cents an hour, compared with 25 cents at present. With a few exceptions—office boys, watchmen and similar employes, hourly rates are far above the new minimum.

Basic work week under the act will be reduced to 42 hours. A longer week requires payment of time-and-a-half for overtime. In most large companies the present standard work week is 40 hours, or the ultimate limit prescribed by the wages and hours act.

Those companies working 44 hours a week, as permitted under the act during the past year, will find it necessary to either pay overtime or adjust schedules within the 42-hour maximum. A variety of contemplated solutions were reported last week.

Some Now Working Overtime

One large firm plans to have workers report 15 minutes later daily and quit work 30 minutes earlier on Saturdays, reducing the work week to 42 hours. Several others indicated they would switch immediately to a 5-day, 40-hour week. Others will continue on present schedules and pay overtime for excess hours. The 42-hour week generally is considered difficult for factory employes.

Considerable overtime has been paid by steel and metalworking plants during the active past six weeks. Management often has decided paying extra wages to experienced men was more efficient and economical than employing new, green workers. Possibility of a recession necessitating dismissal of newly hired men and consequent depletion of unemployment tax reserves also has been a factor.

One of the more important obstacles offered by the higher requirement of the wages and hours act has been apprentice wages. In the past these have often been 25 or 27½ cents, with advancement schedules based on the starting rate. Unless specific exemptions are obtained from the wage-hour administration, apprentices must be paid 30 cents an hour after Oct. 24. The act's administration has been slow to grant exemptions and some plants have considered it easier to raise apprentices' pay to the required 30 cents.

Overtime provision under the 42-hour week becomes effective only for the first full work-week beginning after midnight Oct. 23, according to a ruling last week by the wage-hour administration. The 30-cent hourly minimum, however, becomes effective midnight Oct. 23.

More strict enforcement of the law is planned for the second year of its observance. Several hundred inspectors have been added.

Rumors that Elmer F. Andrews, present administrator, will be replaced before the law's first anniversary continue. It is reported he has been offered a post in the justice department. Reported scheduled to succeed him: Major Philip Fleming, late of resettlement administration and public works admininstration.

Gas Group Elects Officers

■ Walter C. Beckjord, vice president, Columbia Gas & Electric Corp., New York, was elected president, American Gas association, at the organization's twenty-first annual convention in New York, last week. Franklin T. Rainey, general sales manager, Ohio Fuel Gas Co., Columbus, O., was named chairman of the industrial gas section, and H. Carl Wolf, president, Atlanta Gas Light Co., Atlanta, Ga., vice chairman.

A report on the association's convention appears on page 78.

Stainless Steel To Use Ledloy Process

■ Lead-bearing stainless and high-alloy steels will be produced under licenses granted to Allegheny Ludlum Steel Corp., Brackenridge, Pa., and Carpenter Steel Co., Reading, Pa., by Inland Steel Co., Chicago.

Allegheny Ludlum has the right to sublicense other producers in the stainless field, and this license is exclusive, with exception of the Carpenter company.

Inland reports the use of lead-bearing steel has increased rapidly due to easy machining qualities.

Steel Cuts Bonded Debt $360,000,000 in 13 Years

■ Between 1925 and 1938 the steel industry reduced its funded debt by more than $360,000,000, the American Iron and Steel institute has estimated. The reduction effected a yearly saving of nearly $32,000,000 in interest charges which must be paid before considering dividends.

The industry's funded debt was cut from $1,315,000,000 in 1925 to $953,000,000 at the end of 1938, a reduction of close to 30 per cent. Largely because of the debt-reduction program, annual interest charges on the industry's bonds during the five years 1934-1938 averaged $36,000,000 per year, or little more than half of the average annual interest charges in the five years prior to 1925.

Reduction in bonded indebtedness and in fixed interest charges was an important factor in reducing the net losses of the industry in the 1931-1934 depression years and in 1938.

If the industry's interest charges in 1938 had been as large as the average in the five years prior to 1925, its net loss in 1938 would have been about $44,000,000, or nearly three times the actually incurred loss of $14,000,000 for the year.

Most of the debt retirement was effected in the pre-depression years 1925-1929 when earnings on steel shares were sufficient to attract new capital to that type of security. Proceeds of new stock issues were used in part for the retirement of fixed interest-bearing debt.

What's New at Pittsburgh . . .

By R. L. HARTFORD
Pittsburgh Editor, STEEL

■ SIGN of the times is revival of long dormant quotations on shell steel. High-grade bar mill product, usually this is sold in semifinished form, but because of the close rolling tolerances required it is quoted on merchant bar base. High quality extras and close carbon extras apply. Last week it was announced a special extra of $10 would apply on all shell steel. The item probably will appear in the new bar cards.

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Edgar Thomson Output Up

Over the past two years has come what some people refer to as the "metamorphosis" of the Edgar Thomson works of Carnegie-Illinois Steel Corp. In recent years the big Braddock plant has been declining in productivity because of obsolescence of semifinished capacity and reduced rail demand. However, with the new slabbing mill installed to provide material for Irvin works and increasing call for rails, the plant is on the way back. Costs of steel production there are quite favorable; especially low is the blast furnace cost. Further expansion plans in the Pittsburgh district for Carnegie may consider Edgar Thomson works as site for new finishing capacity.

Of its 11 blast furnaces, nine are in reasonably good condition. Eight operated for a short period in 1937. All were idle for the greater part of 1938. After a period of idleness during the 1939 coal strike, operations were resumed and four stacks now are active, a fifth ready to start this week. Work is going ahead on the remaining stacks and these will be blown in soon. All will produce iron. In 1937, two made ferromanganese.

Comparison of the September steel production at Edgar Thomson with July, 1937, the peak in recent years, shows a near-identity. It is certain steel made in October will show the largest total in over ten years; and it still is climbing.

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College Helps Train Foremen

Recognizing a need for better cooperation between employer and employe, Pennsylvania State college has undertaken a unique type of service to industry. Working in conjunction with the Aluminum Co. of America, Pittsburgh, the college will train a selected group of the company's employes in a special series of courses entitled "Preforemanship Training."

It aims first to discover men with talent for leadership; second, to teach supervisors and executives to view their jobs against the background of the entire industry and its relation to the present day world; and third, to equip those leaders with specific aids for their work through detailed instruction in psychology and industrial organization.

Construction as Viewed for 1940

■ TOTAL construction volume for 1940 will approximate that of 1939, according to an estimate by Thomas S. Holden, vice president, F. W. Dodge Corp., speaking at the annual meeting of the Central Supply association, Palmer House, Chicago.

Total building and engineering contracts awarded in the 37 eastern states covered by his company will amount to approximately $3,500,000,000 this year, the largest since 1930. This represents nearly three times the total of the lowest depression year, 1933.

Building costs, he predicted, will rise above present levels, but cautioned suppliers against contributing to a runaway market.

Few Price Increases Justified

"Very few price increases can be justified today on the basis of actual or potential shortages. . . .

"The building industry recognizes that, more than ever before, the potential demand for its product is in the moderate-price field and that rapidly rising building costs would do more to curtail private construction at this time than any other factor in the situation, actually or potentially."

Mr. Holden said the odds are considerably in favor of moderately increased private construction next year. Private residential building should equal, or possibly better, this year's record. Commercial and industrial building and privately-owned utility construction should increase.

Publicly financed construction was due for a smaller or modified program for 1940, even before the war started, as shown by the refusal of congress to authorize a large federal spending program. Public housing activity, however, may be expected to increase in volume. Many contracts are still to be let under the original $800,000,000 loan authorization.

SIDELIGHTS

Pencil Note

■ "A FEW months ago I had a hard time getting orders, but now they are coming in so fast I can't take care of them," said a salesman for a pencil manufacturer, to STEEL. His assignment is to sell pencils by the gross to industrial companies in the Middle West.

"Do I note improvement in their business? Their business has improved so much our factory can't give delivery fast enough. I am going over to call on the — steel company today for a big order. Hope I get it, but if I don't it'll be all right with me."

Can This Be Moonglow?

A salesman writes for some information, adding:

"Our order books are filled for the balance of the year; and I am now getting paid for NOT selling . . . However, don't tell my principals."

No Time To Retire

A veteran employe in a steel company—a key man in his department—passed the age limit recently, and was planning to take a vacation this winter in Florida.

"But they won't let me retire until next year because business now is too brisk," he said. "It's O.K. with me, because I would rather work than loaf, even in Florida."

Daily Salaries

With inrush of orders a steel company wanted more discipline among its office workers. It adopted a formula for "docking" them for absenteeism.

"Put down 365 days for the year," it said. "Now put down 52 Sundays, and 26 days for Saturday half-holidays. Now seven days for legal holidays; and now five days sick leave. That makes 90 days. Deduct that from 365 days, leaving 275 days.

"Divide the annual salary by 275. That gives the daily salary rate. No work, no pay."

September Gear Sales Up

■ Gear sales in September were 31.2 per cent above those of August, and 56.5 per cent above September, 1938, according to American Gear Manufacturers' association, Wilkinsburg, Pa. Association's index for September was 126, compared with 96 in August. Nine months' sales show a gain of 25.6 per cent over comparable period last year.

Washburn Wire Products *are tailor made*

When you want the best-fitting clothes you have them made by a first-class tailor, especially if your figure is more or less different from the "so-called" standard . . . Washburn Wire Co. functions the same as a custom tailor . . . Every customer we have has requirements that are different from every other one and we have made it our business, for a half century, to study these myriad requirements and make sure that the wire we send them fits their needs to a *T*. We are ready to do this for you, too . . . Join our happy family of satisfied customers.

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TEMPERED AND UNTEMPERED FLAT AND ROUND HIGH CARBON WIRES

Windows of WASHINGTON

By L. M. LAMM
Washington Editor, STEEL

WASHINGTON

■ INDUSTRIAL preparedness was discussed here last week at the twentieth annual meeting of the army ordnance association, an organization of industrialists which came into being following the World war. Association's purpose is to co-operate with the war and navy departments in time of emergency.

More than 700 industrialists attended the session, with army and navy experts, participated in round-table discussions and speeches, observed demonstrations of the latest type of army equipment at the Aberdeen proving grounds.

Admiral Harold R. Stark, chief of naval operations, said he didn't know whether or not the United States would get into the European war, but advocated: "Prepare, and stay prepared."

"Many of you have asked me if we are going to war," he stated. "I don't know anyone who can answer that question. But we must realize that we are facing a crisis and we cannot close our eyes to it.

"Our voice and weight of influence in the latter is in direct relation to our state of preparedness. Prudence dictates we strengthen our defenses."

"Arms Best Peace Guarantee"

Admiral Stark and other army and navy chiefs were the principal guests of the civilian leaders as they commemorated not only the birthday of the principal military-industrial society in the United States, but also the twentieth anniversary of the beginning of industrial preparedness in this country.

Benedict Crowell, World war munitions director and president of the association since its inception, declared that in talking of means of keeping the nation at peace he sounded the "object closest to our hearts."

"Preparedness in this era of the double-cross is far and away the best and only method of guaranteeing peace," he said.

Maj. Gen. Charles M. Wesson, chief of the army ordnance department, praised the manufacturers and businessmen making up the association for their work in planning for a new emergency as "the best example of applied patriotism I know of."

Industry Is "Bone and Sinew"

"American industry is the very bone and sinew of the entire body," he declared. "We are counting upon our private industrial plants to produce, in time of war, according to their signed and accepted schedules of production. If these schedules are too optimistic, if deliveries cannot be made in the time expected—then that shortage may be the difference between victory and defeat."

Gen. George C. Marshall, army chief of staff, also addressed the meeting in an "off the record" talk.

Brig. Gen. Charles T. Harris Jr. declared complete conversion of industry from peace to war basis would take two to three years.

"We will not have much time once war starts," he added. "Every effort must be made in peacetime through our industrial preparedness program to cut down this time lag."

General Harris led a round-table discussion of industrial mobilization problems conducted by war department officials.

Questioned by association members as to what would happen to the 8-hour day for labor in an emergency, General Harris declared:

"I do not feel any law will be allowed to impede progress in time of war."

Col. Harry K. Rutherford, chief of planning section in the office of assistant secretary of war, revealed that he has held conferences the past month with justice department officials over relaxation of the anti-trust laws in time of war.

"They were to play ball in cases where our needs require such action," he said.

Col. Frederick Payne, assistant secretary of war under President Hoover, presided at the opening session of the meeting. He told the members and government officials that American industry stands ready to give the army and navy the best fighting equipment in the world, "in the least time, with the least dislocation of our economy and without unusual profit for anyone."

MEANS TO ACCELERATE CONSTRUCTION STUDIED

Opportunities for still further accelerating construction as an aid to business recovery will be considered at a National Construction Conference to be held under the auspices of the chamber of commerce of the United States here Nov. 16 and 17.

Purpose is to point to obstructions checking the flow of private funds into capital expenditures and to suggest means for their removal. These obstacles, in the opinion of the construction and allied interests, mark a weak point in the country's emergence from the depression.

Associated with the chamber in setting up the conference are all divisions of the construction industry—manufacturing, contracting and distributing—as well as professional groups and mortgage financing institutions.

"The stimulation of private construction work has become more—and not less—important as a result of the outbreak of war in Europe," says a statement by the conference's program committee. "The committee is going forward with its plans as earlier contemplated, but has added a discussion of the

possible effects of the war on building.

"The opening session will be devoted to a consideration of the relation of the industry to American progress, including an appraisal of recent criticism of the industry. The remaining sessions will discuss practical suggestions for stimulating more rapid recovery of both residential building and non-residential building."

LONG COURT BATTLE SEEN IN MINIMUM WAGE CASE

Labor department legal experts who have been in conference with the justice department have not yet decided what steps will be taken on last week's minimum steel wage decision by the District of Columbia court of appeals. Indications continue that the government will appeal to the Supreme Court.

Labor department officials are not making any secret of the fact that they were surprised and distressed at the court's decision. The restraining order which was originally granted by the court of appeals is still effective and will be until final adjudication in the case.

In the event the labor department asks the Supreme Court to review the decision and Supreme Court grants an appeal and finally upholds the lower court, the question of the constitutionality of the Walsh-Healey act would still remain to be decided.

STUDY PREVENTION OF RUNAWAY PRICE SITUATION

Members of the commerce department's business advisory council believe industry faces a difficult problem in price increases.

That is one reason why Don Nelson, vice president, Sears, Roebuck & Co., was in Washington last week looking into the price situation. Following some preliminary work by Mr. Nelson, the question has been left in the hands of business economists.

Question of price increases was given considerable attention by the business advisory council at its recent meeting here. Industrialists indicated they understand how vocal the consumer can be in connection with price rises. Some business leaders believe a case will have to be made for industry in connection with any price increases. They realize that when prices of commodities begin to rise, unions will expect wage increases and prices will be pyramided. Feeling was freely expressed that industry must strive to prevent a runaway price situation.

Statements by some of the leaders indicate about 90 per cent of all industry believes that there is going to be a long war, and the commodity price situation is therefore uppermost in their minds. It is known fairly definitely that the administration does not want to embark on price-fixing legislation.

STEEL CASE HEARINGS POSTPONED TO OCT. 23

Temporary national economic committee officials have not yet made public details in connection with steel hearings. Hearings were originally set for Oct. 16 but were postponed until Oct. 23 because the oil hearings were not completed as early as had been anticipated.

Indications are the steel hearings will last at least two weeks and possibly longer. Names of steel executives who will be asked to appear have not yet been made public and probably will not be until shortly before the hearings. Representatives of various mills have been in Washington recently conferring with experts of the department of justice.

BUREAU OF MINES APPRAISES STRATEGIC MINERAL DEPOSITS

To improve the United States' position in strategic minerals, bureau of mines has engineering parties in the field investigating possibilities of eight mineralized areas.

Action was taken in accordance with the strategic materials act which authorized the bureau of mines to appraise ore deposits containing metals designated as strategic.

Deposits now under investigation include antimony, chrome, manganese, tin and tungsten. When President Roosevelt commenting on possible foreign war demands recently called upon owners of commercial stocks of strategic minerals to refrain from selling them to foreign buyers because of their vital necessity to this nation and because of the restricted supply available here, these minerals were named.

Engineering parties will take samples from the deposits by excavation and drilling to ascertain their possibilities as sources of emergency supplies. Work is being carried out in close co-operation with the United States geological survey. The geological survey already has carried out extensive investigation of the ore bodies. Minerals to which the bureau of mines is paying particular attention also include mercury and nickel.

Projects now being explored by the bureau of mines are Valley county, Idaho, antimony deposits; Sweetgrass and Stillwater counties, Montana, chrome deposits; Casper Mountain, Wyoming, chrome deposits; John Day, Oregon, chrome deposits; Olympic peninsula, Washington, manganese deposits; Tinton South Dakota, tin deposits; Catron county, New Mexico, tin deposits; and Nightingale district, Nevada, tungsten deposits.

While prospects for disclosing large deposits of deficient strategic minerals in this country of present commercial grade are admittedly not bright, it is felt that relatively small deposits of commercial grade may be accompanied by "halos" of lower grade material that contain sufficient quantities of needed metal that could be extracted if the demand for the minerals becomes great.

WALSH-HEALEY AWARDS AGGREGATE $2,663,045

During the week ended Oct. 7, the government purchased $2,663,044.64 worth of iron and steel products under the Walsh-Healey act as follows: Lansdowne Steel & Iron Co., Morton, Pa., $28,642.50; Bethlehem Steel Co., Bethlehem, Pa., $168,463.60; Poor & Co., Canton Forge & Axle Works, Canton, O., $10,356.20; R. Wallace & Sons Mfg. Co., Wallingford, Conn., $33,625; United States Pipe & Foundry Co., Philadelphia, $17,350; Lynchburg Foundry Co., Lynchburg, Va., $15,213; Caterpillar Tractor Co., Peoria, Ill., $17,779; Phillips & Buttorff Mfg. Co., Nashville, Tenn., $61,597.10; Hart Mfg. Co., Louisville, Ky., $15,107.50; Butler Mfg. Co., Kansas City, Mo., $980,330 (estimated); A. N. Eaton Metal Products, Omaha, Nebr., $103,766 (estimated); The Stearns Roger Mfg. Co., Denver, $11,101; Kilby Steel Co., Anniston, Ala., $178,220 (estimated); The Sioux Steel Co., Sioux Falls, S. Dak., $165,370 (estimated); Bethlehem Steel Co., Los Angeles, Calif., $58,590; The Stearns-Roger Mfg. Co., Denver, $16,988; Aerial Machine & Tool Corp., New York, $11,361.83; Kay Products Co., Detroit, $11,486.50; Equitable Equipment Co. Inc., New Orleans, $15,442.78 (estimated); Herring Hall Marvin Safe Co., Hamilton, O., $12,820; Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., $99,189; Smith & Wesson Inc., Springfield, Mass., $92,588.00; A. B. Farquhar Co. Ltd., York, Pa., $128,459.10; National Pneumatic Co. Inc., New York, $27,169; Truscon Steel Co., Cleveland, $11,655 (estimated); R. L. Retew & Co., Lebanon, Pa., $51,968.40; the Dicke Tool Co. Inc., Downers Grove, Ill., $19,868.85; Edgcomb Steel Co., Philadelphia, $88,467.28; and General Electric Co., Schenectady, N. Y., $210,070.

Industry Does Not Want War, Again Emphasized by Manufacturers

■ COUPLING a reiteration that American industry strongly desires peace with a warning that war-time prosperity is a delusion, Howard Coonley, chairman of Walworth Co., New York, and president, National Association of Manufacturers, declared war-time profiteering and speculation would be disastrous to our current recovery.

Addressing 500 Ohio industrialists at a regional association meeting in Cleveland, Oct. 9, he asserted business men generally are not going to attempt again to speculate in the products of industry.

"Real Patriotism Means Peace"

"There is a definite effort, on the part of business, to keep prices down. We are urging our membership to keep prices equitably related to costs. The current increase in business, which is substantial, was already well under way before war was declared in Europe."

He further said the association was "100 per cent behind President Roosevelt in his determination to do everything possible to keep us out of war."

"American business men have been unanimous in their insistence this country stay out of the war," stated T. M. Girdler, chairman, Republic Steel Corp. "To the extent that the war has influenced the current rise in industrial activities it is unhealthy. It can only lead to future shocks, maladjustments and headaches. But not all of the rise is due to the war. Industry was making substantial progress toward recovery before the war broke.

"American industry is devoted to America's safety and prosperity," observed Girdler. "It will co-operate with any agency devoted to the same ends. But it will not give up any of its fundamental rights to defend its lawful activities, to advise, criticize and propose, to speak directly to the congress or the people, or to seek the friendship and goodwill of the whole American people."

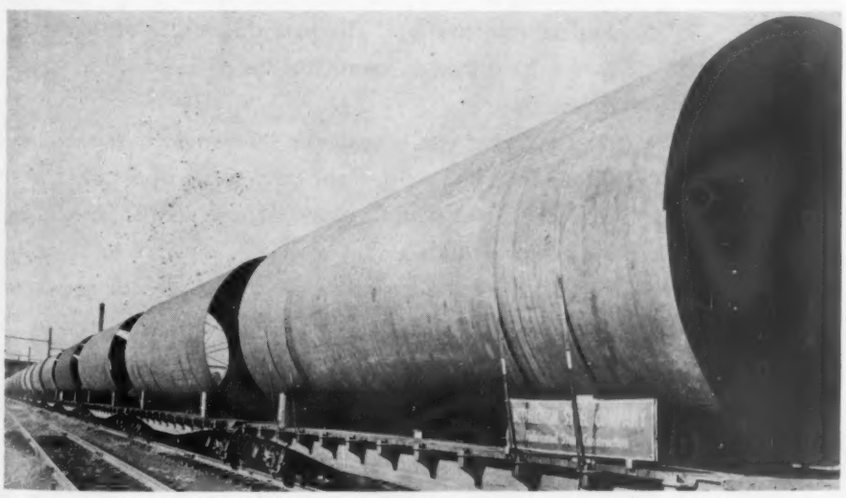
Asserting that representative men in industry are certain real patriotism means peace, C. M. Chester, chairman, General Foods Corp., New York, attacked the doctrines of futility and cynicism as anti-democratic. "American industry's recommendation to the country, in the face of war threats is, 'Let's mind our own business'," he said.

Pledged To Keep Faith

"The National Association of Manufacturers has pledged itself to keep faith with the public, to maintain, however strong the pressure, a nation-wide policy of fair profits and fair dealing. We are determined to keep our own houses in order and to discourage those practices which endanger all industry by overstepping the bounds of decent activity."

Discussing the business outlook today, Merryle Stanley Rukeyser, International News Service economics commentator, stated manufacturers must look beyond temporary expansion of business, and not assume they are "in for a killing."

Steel Tunnel on Wheels



■ **This 50-car trainload of 12 foot 4-inch diameter pipe recently was shipped from Bethlehem Steel Co.'s Leetsdale, Pa., works to Baltimore where it will be used as tunnel lining in a 7-mile water line between Loch Raven and Lake Montebello. In the photograph 2000 feet of the pipe is shown. Project calls for a total of 11,635 feet of 12 foot 4-inch pipe and 1900 feet of 10-foot pipe**

"Sound Profits System Needed"

■ "DURING recent years there has been some tendency to believe that there is something wrong with profits, a tendency to consider 'profits' and 'profiteering' as words of closely similar meaning," said E. T. Weir, in a radio broadcast.

"Nothing could be further from the truth. The American system is the profit system. Without one you cannot and do not have the other."

Mr. Weir, chairman of the National Steel Corp., and president of the American Iron and Steel institute, dealt with fundamentals in his talk to the public:

"The better the wages the more willingly men work. The better the profits, the more willingly men put savings to work. And unless savings are put to work plants lie idle, commerce stagnates, prosperity gives way to depression.

"That is why the necessity to earn profits is always on a business man's mind. He not only wants to, he must earn steady, reasonable profits. But he does not want to earn the quick, apparently easy but unreasonable, and in the end false profits of 'profiteering.' A business man builds his enterprise as a permanent institution. He knows that profiteering breaks confidence, makes enemies and eventually destroys a business enterprise. The fellow who does not know this is no business man. He is a shoddy gambler.

"Every Trick Except One"

"Politicians have tried every trick to restore American industry to a prosperity basis—except one. They have not tried to enable industry to earn a reasonable profit. In fact, the effect of most political schemes has been to make it impossible for industry to earn any kind of profit.

"The politicians failed miserably in restoring prosperity because their plans were unbalanced. They tried to enable the individual to earn wages for his labor while they prevented him from earning wages with his savings.

"Second to avoiding war, the biggest American problem is restoration of a sound profits system to America. When we do this we also will restore sound employment and sound wages. This is our real job."

MUCH STRENGTH IN LITTLE SPACE

When space limitations are severe but strength requirements rigid, designers are faced with a major problem. The use of Molybdenum steels has solved many such problems.

A manufacturer of industrial haulage trucks, for example, was up against that very situation. The drive shafts of this equipment must stand considerable abuse. Quick acceleration and sudden stops are the rule rather than the exception. And space is at a premium.

This manufacturer found in Nickel-Chrome-Molybdenum steel exactly the qualities required — high strength, which permits relatively small section, plus an exceptional combination of toughness, ductility and fatigue strength. The machineability of this steel in the heat treated condition keeps fabrication costs down.

It will pay you to re-check your material specifications in the light of present knowledge of the qualities and characteristics of Molybdenum steels. Our helpful book, "Molybdenum in Steel", is sent free to interested production executives and engineers on request.

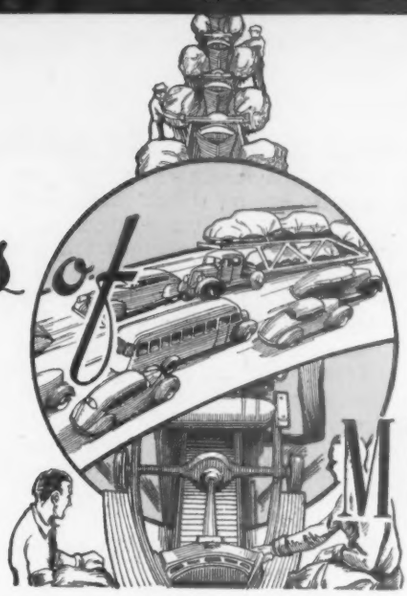
Visit our booth, L-334, at the National Metal Exposition, October 23-27, in Chicago.

PRODUCERS OF MOLYBDENUM BRIQUETTES, FERRO-MOLYBDENUM, AND CALCIUM MOLYBDATE

Climax Mo-lyb-den-um Company
500 Fifth Avenue · New York City

MOLY

Mirrors of MOTORDOM



By A. H. ALLEN
Detroit Editor, STEEL

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DETROIT

■ RIGHT of management to determine production schedules in its own plants was being contested here last week as a preliminary "show of strength" move by the UAW-CIO before opening negotiations for a new contract with Chrysler Corp., former agreement having expired Sept. 30. Charging the company with "speeding up" operations, workmen in the paint spray department of the Dodge division began letting every third or fourth body pass along the line untouched. This deliberate "slow-up" left nothing for the company to do but dismiss the entire force and suspend operations.

The debate then was thrown into the arena of public opinion, following publication of lengthy letters between Herman L. Weckler, Chrysler vice president in charge of operations, and Richard T. Frankensteen, union regional director. Weckler emphasized that "production schedules are the management's function. . . . We do not intend to give the union control of production." Addressing Frankensteen directly on the matter of new contract negotiations, he continued, "When you decided against a further extension (of the contract), you began to trump up false charges, to dig up so-called grievances and to concoct speed-up claims that you should know are unfounded. What you are doing is the old camouflage, Frankensteen, and you know it. So do we. So do the men in the plants. So does the public."

In reply, Frankensteen wrote that "we are asking only that a fair inquiry be made into production standards. . . New models entail new operations. . . For instance, the corporation is producing a crankshaft with a wider base that weighs 4 pounds more than the older ones. That means that each man must lift 3 tons more per day. . . This corporation pays lower wages than its competitors, it ignores the reasonable proposals of its workers and it thumbs its nose at the democratic machinery set up to foster industrial peace."

Dodge Tieup Hits 54,000

Ridiculous as these reports appear to be, nevertheless the fight is on, and has silenced production at the Dodge plant, a key unit in supplying other divisions. Result: Complete tieup of operations in Chrysler and Briggs plants, throwing 54,000 out of work.

Holdups have been issued on shipments of parts to Chrysler plants, but no holdup orders on fabrication. Two federal conciliators arrived here Thursday and union officials agreed to meet with management to discuss a proposed new contract. Meanwhile, union leaders state they are filing with state labor board notice of striking at nine plants in Michigan.

Underground reports of the imminence of union trouble in Chrysler plants have been current for the past month. Now it is evident the UAW-CIO still plans to resort to the ill-considered "slow-down" as its most effective weapon in attempting to bring management to terms. Exasperating as such tactics are, they cannot be considered as an outright strike, in violation of no-strike clauses in union contracts; at the same time they leave no alternative but the closing of plants, for scheduling is disrupted and any semblance of efficient planning is knocked screwy. The story is no

✦

Bumper Cut Away for Zephyrs

■ **Lincoln Zephyr for 1940 features a lower hood extending further forward, a new die-cast radiator grille design, sealed-beam headlamps and other refinements. Note how the front bumper is open at the center section to permit free passage of air through the low grille and into the engine compartment**

different in many another plant in this area, where union shop stewards have even usurped the authority of foremen, yet the management suffers quietly in the hope it can muddle through somehow.

What has happened to Homer Martin, once the exalted high potentate of the UAW? Latest word from his dwindling UAW-AFL camp is his offer to drop claims to recognition in three General Motors plants where dual union committees have stymied collective bargaining, if his opponents, the UAW-CIO, will drop their claims in twelve other GM plants. George F. Addes, UAW-CIO, commented by saying, "If I ever stop laughing I'll ask Martin why he doesn't officially withdraw."

■ NOW that the 1940 models have been ushered in it may be an appropriate time for some general comment on their design implications. Definitely, they are stylists' creations, however much "fashioned for function" they may be. Designers and style experts in many cases have asked engineers to do the impossible in the molding of steel to conform to concepts of smooth line and uninterrupted contour. In particular have bodies been enlarged, both lengthwise and crosswise, involving complicated stampings for which an average die shop probably would despair of making dies.

Take the three-in-one stamping developed for Buick this year, comprising front fender and shroud, hood side and headlamp all in an integral unit. More than a little grief developed in preparing dies for this complicated piece, and more than a little grief still is present in getting production up to an efficient level. For a time, production was running only 35 per hour.

The stamping is made from a blank of sheet steel about 5 by 8 feet in size. One set of dies used in the fabricating operation weighs a mere 32 tons, and at the point of greatest stretching—at the nose of the headlamp—the metal is elongated as much as 50 per cent. Die design, press control and steel quality combine to make what is unquestionably a beautiful stamping. It exemplifies the trend of the past few years toward making the entire side of a body out of a single piece of steel.

However, some engineers profess to scent danger in continuation of this trend. They look ahead a few years to the time when a car built of such stampings reposes on the used car lot with a price tag of one-third the original selling price. When a prospective buyer examines the car and visualizes what it is going to cost him to replace a damaged front fender or a ripped headlamp shell, or a seriously dented shroud he may shudder and pass on to another car on which these various elements are components and can be replaced at a more reasonable figure. One used car dealer here actually has experienced difficulty in moving certain 1939 models because of the high replacement costs of some parts.

The industry may recognize such dangers and eventually revert to smaller parts capable of individual replacement. After all, the new car market is vitally dependent upon the used car market and the buyer of below-average means can be condoned for turning away from cars which involve inordinate replacement parts cost. A case in point is the single-unit die cast radiator grille which a few years ago cost as much as $60 to replace. Later, engineers redesigned some of these grilles and made them of six or eight smaller pieces, any one of which could be replaced at lower cost.

An automobile body whacked out of three single pieces of steel would be a beautiful thing to behold and a high tribute to the art of metal fabrication, but from a practical merchandising standpoint might be a white elephant after three years on the road.

There is considerable unanimity of opinion, locally, that Fisher Body has achieved a real coup with its new line of Torpedo bodies, in spite of what has been said above. Even the competition has been admiring them and it is no idle rumor to report there have been discussions about immediately undertaking comparable designs to compete with the Buick - Olds - Pontiac - Cadillac - La Salle bodies.

Behind their development lies an interesting story of advances in manufacturing technique, improved equipment and better drawing qualities in sheet steel. E. F. Fisher, general manager of Fisher Body division, observes that heretofore it has been considered necessary to equip large presses used in forming turret tops and other wide body panels with flywheels and clutches to obtain sufficient momentum for the deep draw. Direct-drive presses have now been developed, and Fisher claims to have one such triple-action type, the only one of its kind in the world. It is driven through gears by a specially-wound high-torque motor, operating only when the slides are in motion. Having only 130-inch bed, it is not the largest press in Fisher stamping plants but exerts total pressure of 4,200,000 pounds—outer slide 600 tons, inner 900 tons and lower 600 tons. This is nearly half the power developed by four presses used in fabricating the one-piece steel top when first introduced years ago.

Automobile Production

Passenger Cars and Trucks—United States and Canada

By Department of Commerce

	1937	1938	1939
Jan.	399,186	226,952	356,950
Feb.	383,900	202,597	317,517
March	519,022	238,447	389,489
April	553,231	237,929	354,263
May	540,377	210,174	313,214
June	521,153	189,402	324,235
July	456,909	150,450	218,478
Aug.	405,072	96,946	103,343
8 mos.	3,778,850	1,552,897	2,377,489
Sept.	175,630	89,623	*192,000
Oct.	337,979	215,286	.....
Nov.	376,629	390,405	.....
Dec.	347,349	406,960	.....
Year	5,016,437	2,655,171	.....

*Estimated.

Estimated by *Ward's Reports*

Week ended:	1939	1938†
Sept. 16	41,245	16,100
Sept. 23	53,950	20,390
Sept. 30	62,755	25,405
Oct. 7	76,095	37,665
Oct. 14	75,860	50,540

†Comparable week.

	Week Ended Oct. 14	Oct. 7
General Motors	34,260	24,925
Chrysler	10,025	24,925
Ford	18,900	13,610
All others	12,675	12,635

Announce Chevrolet for 1940

Chevrolet has announced three restyled series of cars for 1940, all on 113-inch wheelbase, with overall length increased 4⅜ inches. Radiator grille is set low and the front-end design, taken as a whole, is suggestive of the balance of the General Motors lines. Steering column gearshift, with vacuum booster, is now standard on all models. Hood is of the alligator type, hinged at the rear and locked with a double system of catches, one released by a lever on the dash, and the other by depressing a plate at the front.

Engine has a number of revisions, including the new type of steel and iron tappet described here Aug. 7. Other changes involve the oil system and the camshaft. Headlamps, of the sealed-beam type, are mounted in 20-inch shells nestled on the front fenders, 10 inches farther apart than last year. Small parking lamps are in separate shells placed next to the headlamps.

Bodies of sedan models are patterned after the Cadillac 60 and Torpedo lines. Rustproofing, heretofore confined to fenders and hoods, is now applied to body panels as well. Trunks are somewhat larger and are illuminated through apertures in the rear of the recessed tail lamp shells.

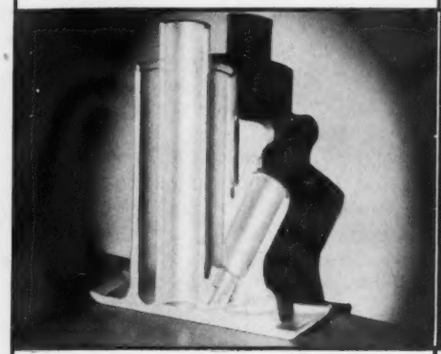
Increased power and torque are

(*Please turn to Page* 80)

1 2 3 4 WHAT ARE THE BIG 4 IN DIE CASTING? —A Quiz

1-STRENGTH?

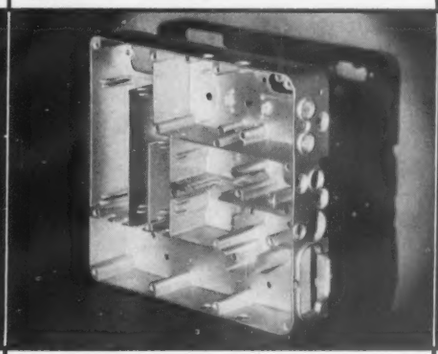
Can strength be considered as one of the 4 outstanding characteristics of a die casting?



A The entire housing of a well-known automobile jack is a one-piece ZINC Alloy Die Casting (sectionalized view above). This method of construction was adopted after extensive hydraulic pressure tests were made. The die cast housing was found to withstand a pressure of 60 tons on a section of approximately 1/8".

3-COMPLEXITY?

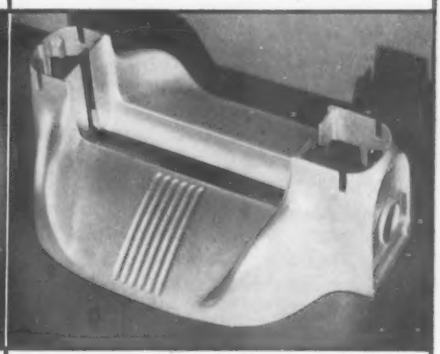
Why is die casting such an important factor in any consideration of complex parts?



A Complexity of design means economy—thru the elimination of assembly operations. You can appreciate the savings realized by producing this radio chassis as a one-piece ZINC Alloy Die Casting. It is highly probable that this design would not have been economically possible if all of the internal elements had to be assembled into place.

4-ECONOMY?

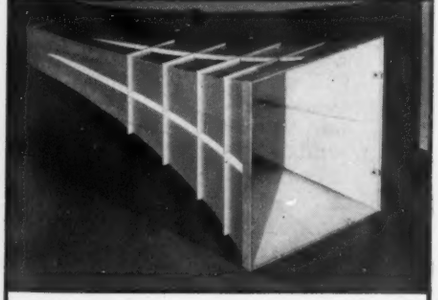
Is the rapidly increasing use of die castings based principally on economy?



A The economy of ZINC Alloy Die Castings is an accepted fact—as is revealed by the cost figures on this washing machine wringer frame. Actually, this metal and method of production is generally chosen for its excellent physical properties—the inherent economy being the factor that clinches the choice.

2-ACCURACY?

How do die castings compare with other types of metal parts from the standpoint of dimensional accuracy?



A This is a loud speaker horn for a public address system. It was absolutely essential that this part be accurately shaped to form a perfect acoustical path. In the final analysis the part was specified to be die cast in ZINC Alloy.

The four ZINC Alloy Die Castings shown here are featured in this Company's exhibit at the National Metal Exposition—along with hundreds of other applications from many fields. If you are planning to attend the Exposition we will look forward to a visit with you. If you cannot be present, we suggest that you plan to visit your local commercial die caster—or write to The New Jersey Zinc Company, 160 Front Street, New York, for additional information.

BOOTH L-311 NATIONAL METAL EXPOSITION
International Amphitheatre
CHICAGO—OCT. 23-27

ZINC ALLOY DIE CASTINGS

The Research was done, the Alloys were developed, and most Die Castings are made with

HORSE HEAD SPECIAL (99.99+% Uniform Quality) ZINC

Machine Tools Neutralizing Effect of High Distribution Costs and Taxes

■ TOOL ENGINEERS from as far away as California, and one from France, were among the 500 who attended the semiannual convention of the American Society of Tool Engineers in Cleveland, Oct. 6 and 7.

The banquet, Oct. 6, was the occasion for the presentation by John Younger, professor of engineering, Ohio State university, of the second or intermediate report on "The Effect of the Development of the Machine on Employment and Our Standard of Living".

As chairman of the A.S.T.E. fact-finding committee, Professor Younger stressed the point that use of improved manufacturing equipment, especially machine tools, has served in a large measure to offset rising costs of distribution and taxes. Therefore, such equipment should be called "cost reducing machinery", rather than "labor saving machinery", the latter frequently being misinterpreted.

Machines Wrongfully Blamed

As examples of mechanization wrongfully blamed as causing unemployment, he cited the coal and cigarmaking industries. What really has caused unemployment in the coal industry, he said, is a lessened demand for coal due to increasing use of gas and oil fuel; coupled with a rise in boiler efficiency. Incidentally, mechanization has tended to reduce coal mining costs, but increased wages have counteracted this saving.

Mechanization in cigar manufacture has been blamed for the 52 per cent reduction in the number of employes. The fact is, however, that popularity of cigarettes within the past few years has caused a 76 per cent reduction in cigar consumption.

Hamilton Fish, congressman from New York, stated American labor today is better off than labor anywhere else in the world. Mass production is here to stay, and American tool engineers are largely responsible for its success, a fact which evidently is widely recognized abroad, judging from the extent to which foreign countries have adopted American manufacturing methods.

Mr. Fish recently returned from Europe, said he would vote for billions for national defense, but not one cent to send American soldiers to foreign lands to fight other countries' battles.

Other speakers at the banquet were James R. Weaver, director of equipment, inspection, purchases and test, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; and Tell Berna, general manager, National Machine Tool Builders' association.

As president of the A.S.T.E., Mr. Weaver presided.

Saturday morning, Oct. 7, was devoted to a symposium on bearings, with G. J. Hawkey, chairman, Cleveland chapter, A.S.T.E., presiding. In the absence of Stanley R. Thomas, chief engineer, Bantam Bearings Corp., South Bend, Ind., his paper on "Application and Use of Anti-friction Bearings as Applied to Machine Tools" was read by H. E. Ewart, assistant chief engineer of the company. Through the use of slides showing diagrammatically the installation of various types of ball and roller bearings, with load diagrams and tables showing commercial limits of accuracy, Mr. Ewart made clear what might be expected of these bearings under practical service conditions.

Eugene Bouton, supervisor of time study, J. I. Case Tractor Works, Racine, Wis., dealt with "Application and Use of Plain Bearings as Applied to Machine Tools." Pointing to the progressively increasing speeds and pressures to which machine tool bearings have been subjected because of the use of high-speed steel, stellite and now tungsten and tantalum carbide tools, Mr. Bouton urged machine tool designers to study their bearing problems so that in every instance they will be sure to "get the right kind of bearing in the right place."

Urges Heed to Bearings

He expressed the opinion that not enough attention has been paid lately to the design of plain bearings, this in the light of recent important developments in bearing metals, in methods of finishing bearings and shafts, and in tough film lubricants. "Chatter and vibration must be avoided in any production machine tool, if it is expected to turn out good work with minimum of tool wear and tool breakage, and bearings play a vital role in that direction," he said.

Other speakers and commentators at the final session were Karl L. Herrmann, consulting engineer, South Bend, Ind., who suggested the use of the general term "rolling bearings" to cover both ball and roller types; S. L. Crawshaw, application engineer, Nuttall works, Westinghouse Electric & Mfg. Co., Pittsburgh, who emphasized the importance of carefully designed mountings for bearings of every type; and A. B. Willi, chief engineer, Federal-Mogul Corp., Detroit, who expressed the thought that it is time trustworthy engineering and design data comparable to that which is readily available on rolling bearings, be made available in connection with plain bearings.

Delegates visited plants of Acme Machinery Co., Graphite Bronze Co., National Acme Co., National Screw & Mfg. Co., Parker Appliance Co., Republic Steel Corp., and White Motor Co.

P. J. Potter Elected Foundry Equipment Head

■ P. J. Potter, vice president, Pangborn Corp., Hagerstown, Md., was elected president of Foundry Equipment Manufacturers' association at the annual meeting, White Sulphur Springs, W. Va., Oct. 6 and 7. Thomas Kaveny Jr., vice president, Herman Pneumatic Machine Co., Pittsburgh, was made vice president and Arthur J. Tuscany, Cleveland, was re-elected executive secretary.

New members of the board of directors include: E. O. Beardsley, president, Beardsley & Piper Co., Chicago; B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.; and Thomas Kaveny Jr.

The two-day program included discussions of business trends. All members indicated business improved to a marked extent during September and that prospects for additional purchases of equipment are bright.

C. E. Hoyt, executive vice president, American Foundrymen's association, Chicago, discussed, "The Common Interest of the Foundryman and the Foundry Equipment Manufacturer." James R. Allan, assistant manager, industrial engineering and construction department, International Harvester Co., Chicago, and chairman of the hygiene codes committee of the American Foundrymen's association, presented an interesting discussion on "A User's Observations Regarding the Foundry Equipment and Supply Industry."

W. R. Bean, vice president, foundry equipment division, Whiting Corp., Harvey, Ill., described his impression of conditions in England and the Continent as gained during a trip immediately following the International Foundry conference in London during the past summer.

Activities of Steel Users, Makers

■ FERRO Enamel Corp., Cleveland, has completed its "largest September," in number of pounds of porcelain enamel shipped. Tonnage for the month exceeds that of September, 1938, by 62 per cent, and of August, by 27 per cent. Shipments for the first nine months exceed those of the same period a year ago by 75 per cent.

♦

American Screw Co., Providence, R. I., has received notification that the co-operative advertising campaign on Phillips recessed head screws, was selected by the National Industrial Advertisers association as one of the 20 outstanding industrial campaigns of the year. Awards were made at the recent convention of the association in New York.

♦

Cleveland Punch & Shear Works, Cleveland, has awarded contracts to the Austin Co., Cleveland, for the design and construction of a 34,000 square foot addition to its plant. The project will represent an investment of approximately $250,000 for plant and equipment.

♦

United Fabricators, Wooster, O., has been incorporated to manufacture steel and iron products, with W. C. Martin as president; W. F. Schultz, vice president, and V. K. MacLeod, secretary and treasurer. All three formerly were associated with Republic Steel Corp., Cleveland. It is understood the new company will occupy the idle plant of the United Engineering & Foundry Co.

♦

Nitralloy Corp., New York, has licensed Metallurgical Laboratories Inc., Philadelphia; Ontario Research Foundation, Toronto, Ont., and Pittsburgh Commercial Heat Treating Co., Pittsburgh, commercial heat treaters, to use its patented process. The company now has 11 agents in the commercial nitriding field, located in Camden, N. J., Detroit, Cleveland, Chicago, Boston, Cincinnati and Milwaukee, in addition to the above cities.

♦

Ransome Concrete Machinery Co., Dunellen, N. J., maker of welding tables and positioners, has appointed the Fuchs Machinery & Supply Co., Omaha, Nebr., its representative in part of Nebraska and Iowa.

♦

Reliance Steel Co., Detroit, which recently transferred its principal operations in the Detroit area to a new $150,000 plant at 13770 Joy road, plans to construct a 20,000 square foot addition to accommodate its coil steel division. Completion of the addition will centralize all the company's Detroit operations. Contract for erection of the addition has been awarded the Austin Co., Cleveland.

♦

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y., has made the following appointments on the Pacific coast: Stone Ryals Electric & Mfg. Co., representative in San Francisco district and Preston Faller, at Seattle.

♦

National Fireproofing Co., manufacturer of brick, tile and other clay products, is preparing to reopen its East Liverpool, O., plant, idle since 1933.

♦

Trenton Auto Radiator Works, Trenton, N. J., has changed its name to Kramer Trenton Co. Nathan Kramer is president of the new company, and Israel Kramer, secretary-treasurer.

Industrial Construction Costs Advance Slightly

■ Industrial construction costs advanced approximately 5 cents a square foot to an average of $1.45 in the third quarter this year, according to the Austin Co., Cleveland.

Present costs compare with a 25-year average of $1.50 a square foot and a record high of $2.67 in the post-war booms in the early '20s. They do not include heating, lighting or plumbing costs.

George A. Bryant Jr., executive vice president, announced September contracts signed by the company exceeded the total authorized during the previous three months.

"The present upturn follows steadily increasing business during the summer months, and is particularly significant because most of our new work has no direct relationship with the current international situation."

Copper Alloy Bulletin Index Available

■ Now available is the index covering contents of 1938 issues of the *Copper Alloy Bulletin*, published monthly in STEEL, as advertisements by Bridgeport Brass Co., Bridgeport, Conn. It provides a ready reference to information of broad scope, of permanent interest and value to consumers of copper and its alloys. Copies of the index may be had from the company.

MEETINGS

STEEL CONSTRUCTORS LIST SPEAKERS FOR CONVENTION

■ E. T. WEIR, chairman, National Steel Corp., Pittsburgh, and president, American Iron and Steel institute, will address American Institute of Steel Construction at the banquet on the first evening of its seventeenth annual convention, Waldorf-Astoria hotel, New York, Oct. 17-18.

A. D. Whiteside, president, Dun & Bradstreet Inc., New York, will speak on "Competitive Practices" at a luncheon on the first day, and Paul G. Hoffman, president, Studebaker Corp., South Bend, Ind., on "Highway Safety—The New Dynamic," at another on the second day.

Other addresses scheduled are: "When May a Renewed Demand for Urban Building Be Expected and Probable Character of Structures," by Henry Wright, associate editor, *Architectural Forum*, New York; "Immediate Problems of Our Industry," by Robert T. Brooks, executive vice president of the institute, New York; "Ductility and Strength of Structural Steel as Influenced by Rivet Holes and Type of Connections," by Dr. J. A. Van den Brook, professor of engineering mechanics, University of Michigan, Ann Arbor, Mich.; and "Experience with Welded Structures in Belgium," by Leon Rucquoi, director, Institute of Steel Construction of Belgium and Luxemburg.

CONFERENCE TO DEAL WITH METALS IN TRANSPORTATION

Scientists, research men and technicians from laboratories of industrial corporations, government bureaus, research foundations and technical schools will meet in Ann Arbor, Mich., Nov. 1, for a conference on "New Technologies in Transportation," sponsored by the University of Michigan and *Life Magazine*.

The conference is "designed to examine new methods, new materials and new directions in the transportation field." It will deal with aspects of engineering, metallurgy, thermodynamics, structure, tensile strength, speed and capacity in air, automotive, highway, rail and marine transportation. A series of roundtable discussions will deal with specific 1939 achievements in the respective fields, including lightweight alloys, high-strength steels, protective coatings, welding, combustion, plastics, high-temperature cooling and lubrication, and vibration control.

MEN OF INDUSTRY

■ JOSEPH E. OTIS JR., for six years president, Stewart-Warner Corp., Chicago, has resigned to become president, Dodge Mfg. Corp., Mishawaka, Ind., effective Nov. 1. A graduate of Yale university in 1916, he was an engineer with Union Carbide Co. from 1916 to 1920 when he joined Belden Mfg. Co. In 1921 he organized Inland Metal Products Corp., and from 1923 to 1933 was vice president and general manager, Alemite Corp. He then became president of Stewart-Warner.

♦

M. C. Callahan and John N. Lord have been elected to the board of directors, Detroit-Michigan Stove Co., Detroit.

♦

Frank C. Riecks, power and construction department, Ford Motor Co., recently assigned to special duties with Ford interests in France, has returned to Dearborn, Mich.

♦

Otto V. Kruse, general sales manager, Baldwin Locomotive Works, has been elected a member of the board of directors, General Steel Castings Corp., Eddystone, Pa.

♦

A. E. Dieckman has been appointed assistant to works auditor, Carnegie-Illinois Steel Corp., Gary works, and H. F. Nichols has been named timekeeper, succeeding Mr. Dieckman.

♦

Julius Kahn has resigned as vice president, Republic Steel Corp., Cleveland. Mr. Kahn joined the Republic organization following its acquisition of Truscon Steel Co., and had been in charge of product development.

♦

Elwin A. Andrus, the past ten years in charge of the patent department, A. O. Smith Corp., Milwaukee, has opened his own patent office in the First Wisconsin National Bank building, Milwaukee.

♦

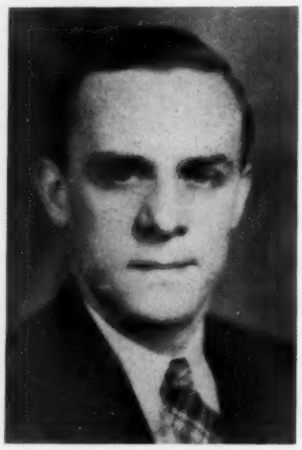
Merlyn M. Culver, formerly with Bendix Marine Products Co., South Bend, Ind., in a sales capacity, has been appointed manager, outboard motor sales, Kiekhaefer Corp., Cedarburg, Wis.

♦

Richard W. Yerkes has retired as secretary-treasurer, Link-Belt Co., Chicago, but will continue to serve as a member of the board of directors. Mr. Yerkes joined the company in 1890. Harry E. Kellogg, associated with Mr. Yerkes the past 18 years, has been elected to succeed him as treasurer. F. V. MacArthur, formerly assistant secretary, has been made secretary.

♦

George L. Abbott has been made a director, vice president and general sales manager, Graton & Knight Co., Worcester, Mass. Mr. Abbott will pay particular attention to strengthening the company's mill supply dealer setup, having had 25 years experience in the tanning and belting industry. He formerly was president, Philadelphia Power club, an affiliate of the Power Transmission council. At present he is vice president, American Leather Belting association; vice president, Philadelphia Leather Belt club and chairman of the exhibitors' committee, American Supply and Machinery Manufacturers association.



George L. Abbott

♦

Harlow B. Mondey, identified with coal sales work since 1921, has joined the marketing division staff of Appalachian Coals Inc., Cincinnati. He formerly was assistant to the president, Elk Horn Coal Corp., Cincinnati.

♦

Ralph W. Young, associated with Charles H. Besly & Co., Chicago, more than 20 years, has been named general superintendent, succeeding the late John Miller Jr. Leo E. Jacobs has been promoted to the vice presidency.

♦

Carl Harmon, at one time metallurgist and foundry superintendent, Chevrolet Gray Iron Foundry, Saginaw, Mich., has organized and is general manager, Saginaw Metal Products Co., which is now entering upon a program of steel castings production. All equipment has been installed.

♦

L. A. Young has been elected president and re-elected chairman of the board, L. A. Young Spring & Wire Corp., Detroit. C. M. Young, who had been serving as president, has been made vice president, which office he held prior to the presidency.

♦

Elbert D. Peck, former first vice president and general manager, Devoe & Raynolds Co. Inc., has become associated with the paint division of Pittsburgh Plate Glass Co., Pittsburgh. He will be detailed to special activities.

♦

Harry E. Ankeney, heretofore with the Chicago office of Cutler-Hammer Inc., Milwaukee, has been placed in charge of the company's Indianapolis territory, with headquarters at 307 North Pennsylvania avenue.

♦

A. R. Hauschel, manager, export department, J. I. Case Co., Racine, Wis., and associated with the company many years, has been elected a director to fill the vacancy caused by the recent death of W. F. MacGregor.

♦

Peter R. Foseid, Freas M. Long and William Meade, foreign representatives of Gisholt Machine Co., have returned to Madison, Wis., from Europe. Mr. Long had been there since 1905, the others since earlier this year.

♦

J. H. Crawley, formerly foundry superintendent, Pontiac Motor division, General Motors Corp., Pontiac, Mich., is now assistant foundry superintendent, McKinnon Industries Ltd., St. Catherines, Ont., an affiliate of General Motors of Canada.

♦

R. D. Sheen has been appointed manager at Milwaukee for Western Electric Co. Inc., New York. He succeeds W. A. Steward who has been given supervision over Nebraska, North and South Dakota, Minnesota and Iowa, with headquarters at Omaha, Nebr.

♦

L. H. Frost, formerly chief sales engineer, a. c. division of Electric Controller & Mfg. Co., Cleveland, has been made district manager in the Detroit area for Thomson-Gibb Electric Welding Co. The Detroit office has been moved to 307 Boulevard building from the General Motors building.

♦

A. J. Fazio, heretofore day superintendent, has been named assistant general superintendent, Braeburn Alloy Steel Corp., Braeburn, Pa., in

charge of all day and night units. Mr. Fazio, a graduate of the University of Pittsburgh, was associated with the Crucible Steel Co. of America prior to joining Braeburn.

♦

George W. Romney, heretofore representative of the aluminum industry at Washington for several years, has been selected by the board of directors, Automobile Manufacturers association, as manager of the Detroit office. The association is moving its headquarters to the New Center building, Detroit.

♦

Harold G. Wolfram, associated with Porcelain Enamel & Mfg. Co., Baltimore, the past 15 years, serving as laboratory technician, director of research, and more recently as factory manager, has been elected vice president. In his new post he will have charge of all engineering and technical activities of the company.

Harold G. Wolfram

♦

C. R. Culverhouse, heretofore assistant to the comptroller, Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has been promoted to assistant comptroller in charge of accounting. He began his service with the United States Steel Corp. in 1907 when he was employed by the Tennessee company as a typist in the accounting department.

♦

A series of appointments to superintendencies at Bethlehem Steel Co.'s Bethlehem plant was announced last week.

G. J. Buckner is promoted from superintendent of forges and heat treatment division to superintendent of foundry, forge, shop and treatment divisions.

C. A. Bever, superintendent of roll and steel foundries, becomes superintendent of foundries, including roll, steel, brass, iron and ingot mold, and also the pattern shop.

J. J. Coffey, formerly superintendent of foundry and shops, becomes superintendent of shops, including shops No.'s 2, 3, 6, 8 and the central tool department.

I. S. Reiter is promoted from superintendent of the drop forge department to superintendent of forges and heat treatment division, including press and hammer forge, drop forge, forge specialty and treatment departments.

N. E. Greth, formerly assistant superintendent of roll and steel foundry, becomes superintendent of roll and steel foundry.

Robert Latham, former foreman in the iron foundry, is promoted to superintendent of the iron foundry, succeeding J. T. Mitchell, retired.

M. G. Smith is promoted from master mechanic of drop forge to superintendent of the drop forge department.

♦

J. Hall Burton has been appointed director of exports, Grob Bros., Grafton, Wis., makers of band saws, continuous motion filing machines and velocity action briquetting machines.

♦

C. E. H. Palmer has been named manager, New Haven, Conn., office of General Electric Co., Schenectady, N. Y. He entered the testing department of General Electric in 1919; was made an office engineer of International General Electric Co. the following year; in 1923 was transferred to the central station department of General Electric as a commercial engineer, and since 1930 had been with the company's Newark, N. J., office.

DIED:

■ WILLIAM C. ACKLIN, 51, since 1936 president, Acklin Stamping Co., Toledo, O., and a prominent figure in the automobile industry, Oct. 9.

♦

A. F. Rader, 67, president and general manager, Belmont Iron Works, Philadelphia, Oct. 9.

♦

Aaron Glazer, 59, founder, Glazer Iron & Metal Co., Knoxville, Tenn., at his home in Knoxville, Sept. 10.

♦

Henry Allen, 67, maintenance superintendent, Campbell, Wyant & Cannon Co., Muskegon, Mich., at his home in Muskegon Heights, Oct. 8.

♦

Wilfred D. Lowe, formerly manager, structural department, Koppers Co., Pittsburgh, at his home in Atlantic City, N. J., Oct. 2.

♦

Rasmus Rasmussen, 70, operator of the Rasmussen Machine Works, Martinette, Wis., in that city, recently.

♦

Albert H. Beckman, 62, comptroller, A. O. Smith Corp., Milwaukee, recently in an automobile accident, while enroute to Lake Poygan for a week end of fishing.

♦

Henry J. Molling, a partner in the Expert Die & Tool Co., Detroit, in that city, recently. He was a member, Resistance Welders Manufacturers' association.

♦

Wellington C. MacEwen, 82, associated with the Allis-Chalmers Mfg. Co., Milwaukee, over 40 years as an engineer, until his retirement four years ago, at his home in New Rochelle, N. Y., Oct. 3.

♦

A. M. Finnie, 45, treasurer, African Metals Corp., New York, Oct. 6. A native of Scotland and a graduate of Aberdeen university, he spent several years in foreign trade prior to joining African Metals in 1935.

♦

Frank Hamlett, 51, associated with National Tube Co. 30 years as a salesman, in Cleveland, Oct. 10. A native of England, Mr. Hamlett came to this country in 1907 and was employed by the tube company in Pittsburgh until his transfer to Cleveland three years ago.

Steel in Use in Nation Totals 1,130,000,000 Tons

■ Steel in use in the United States rose to a new high during 1938, amounting to approximately 1,130,000,000 tons at the close of the year, as estimated by the American Iron and Steel institute.

Included is steel in capital goods such as buildings, bridges, machinery, railroad equipment, ships and the like, and also the steel in automobiles, house furnishings and other consumers' goods.

Since 1900 the amount of steel has increased nearly 17 times as fast as the nation's population, with the result that use per capita in 1938 was 650 per cent above the level of 1900. The increase is an indication of the rise in living standards.

Nearly 19,500 pounds were in service last year for every man, woman or child in this country, as against 2600 pounds in 1900, and 18,100 pounds in 1937.

Improved technology in manufacture and use of steel in past 20 years, including the rise of stainless and other alloy steels, has extended the average life of steel in service. At present the useful life of all the different kinds of products made from steel is estimated to average about 35½ years. By comparison, in 1920 the estimated life was 23 years.

Editorial

Metal Congress' Place in Industry

■ EACH year the annual Metal Congress and show is an event of vital significance to the metal producing and metalworking world. Each 12-month period witnesses the accumulation of important new knowledge pertaining to metals. The discussions at the congress and the exhibits at the show reveal these as the accomplishments of the moment. They also suggest trends of the immediate future. Each year this occasion deserves major attention.

Those who are planning to attend this year's congress and show at Chicago, Oct. 23-27, should study the Metal Congress and Show insert section in this issue, especially that portion (pp. 108-159) devoted to progress made during the past year. This is summed up pictorially, also in written comments by 42 recognized authorities. This special section is intended to convey a broad picture which will permit a better understanding of the discussions and exhibits scheduled this year for Chicago during the week of Oct. 23.

Discussions, Exhibits To Emphasize Improved Manufacturing Techniques

A low-temperature heat treatment method developed during the past year results in improving the elastic properties of cold rolled 18-8 stainless steel.

Improvements in technique have made it possible to extrude nickel silver with a nickel content as high as 20 per cent.

Now available for application to sheet, strip, tubing, wire and other products is a new type of dual coating, electrically applied and heat treated, which offers superior resistance to corrosion.

Several new types of high speed steel which show unusually high resistance to wear have been introduced during the past year. They contain a much higher molybdenum content; in some cases molybdenum entirely replaces tungsten.

Now in operation is a new process for production of pure manganese metal, heralding new possibilities in manganese—base alloys.

Beryllium-cobalt-copper alloys now are available in the form of strip and wire.

Developments in Fabrication Methods Promise Higher Quality Products

The oxyacetylene flame now is being used for gouging, also for descaling and dehydration of steel surfaces to provide tighter adhesion for coatings.

Discovery of the beneficial effect of tellurium on machinability of copper alloys has been followed by the introduction of several commercial alloys employing this element.

Braze welding of galvanized steel pipe so as not to destroy its corrosion-resistant properties now is a reality.

Die castings now are being reshaped by a new cold forming process.

A new continuous high-speed automatic arc welding process has emerged from research secrecy to commercial application.

These are but a few of the developments now available for the production of improved materials and for their more effective fabrication. Many of these appear to have profound importance for the present and immediate future. A better understanding of their potentialities is bound to crystallize as a result of attendance at the congress and show in Chicago.

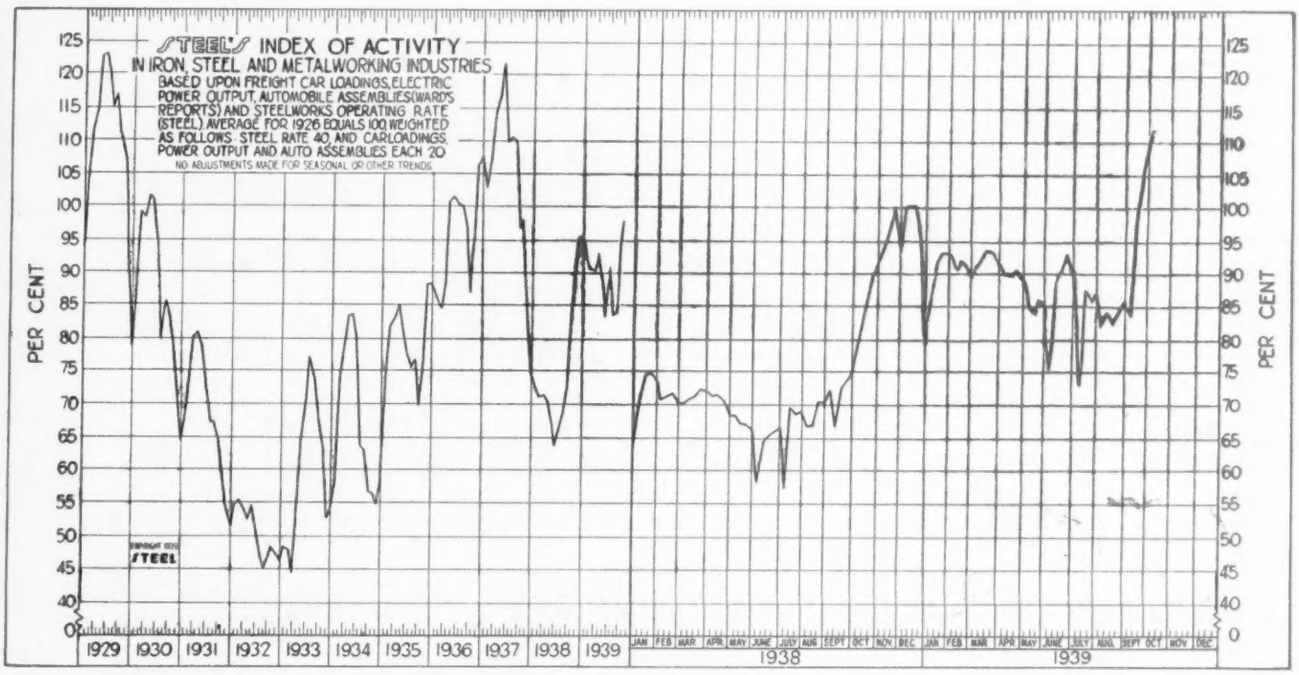
The BUSINESS TREND

Industrial Activity Moves Higher, at Slower Pace

■ REFLECTING additional gains in steelmaking operations and automobile production during week ended Oct. 7, STEEL's index of activity continued the upward trend of recent weeks to touch a new high for the year. The index now stands at 112.4, a gain of 4.5 points over the previous week and remains well above the 78.9 level recorded during the comparable week last year. Further gains in the index should develop during the next few weeks, but not at the pace registered throughout September.

The national steel rate is approaching peak operations for the industry and a leveling off at approximately 90 per cent seems probable. During the week ended Oct. 7 the steel rate was 87.5 per cent, a gain of 4 points over the preceding week. In the comparable period last year steelworks production was 48.5 per cent. The current level of steelmaking operations of nearly 90 per cent represents a gain of 28 points or 45 per cent above the rate of 62 per cent reported in the week ended Sept. 9.

An encouraging factor in the immediate outlook, that should be instrumental in lifting the index to still higher levels, is the continuation of the seasonal upturn in automobile production. Assemblies during the week ended Oct. 7, totaled 79,095 units. This compares with 62,755 cars and trucks produced in the preceding week and is more than double the total of 37,665 units assembled in the same week last year. Motor car output



STEEL'S index of activity advanced 4.5 points to 112.4 in the week ended Oct. 7:

Week ending	1939	1938
July 22	86.0	68.7
July 29	86.8	69.0
Aug. 5	83.5	66.9
Aug. 12	83.9	66.9
Aug. 19	82.2	70.5
Aug. 26	83.4	70.3
Sept. 2	86.3	72.3
Sept. 9	83.7	66.8
Sept. 16	97.5	72.9
Sept. 23	103.0	74.0
Sept. 30	107.9	74.9
Oct. 7	112.4†	78.9

†Preliminary.

Mo. Data	1939	1938	1937	1936	1935	1934	1933	1932	1931	1930	1929
Jan.	91.1	73.3	102.9	85.9	74.2	58.8	48.6	54.6	69.1	87.6	104.1
Feb.	90.8	71.1	106.8	84.3	82.0	73.9	48.2	55.3	75.5	99.2	111.2
March	92.6	71.2	114.4	88.7	83.1	78.9	44.5	54.2	80.4	98.6	114.0
April	89.8	70.8	116.6	100.8	85.0	83.6	52.4	52.8	81.0	101.7	122.5
May	83.4	67.4	121.7	101.8	81.8	83.7	63.5	54.8	78.6	101.2	122.9
June	90.9	63.4	109.9	100.3	77.4	80.6	70.3	51.4	72.1	95.8	120.3
July	83.5	66.2	110.4	100.1	75.3	63.7	77.1	47.1	67.3	79.9	115.2
Aug.	83.9	68.7	110.0	97.1	76.7	63.0	74.1	45.0	67.4	85.4	116.9
Sept.	98.0	72.5	96.8	86.7	69.7	56.9	68.0	46.5	64.3	83.7	110.8
Oct.	....	83.6	98.1	94.8	77.0	56.4	63.1	48.4	59.2	78.8	107.1
Nov.	....	95.9	84.1	106.4	88.1	54.9	52.8	47.5	54.4	71.0	92.2
Dec.	....	95.1	74.7	107.6	88.2	58.9	54.0	46.2	51.3	64.3	78.3

within the next few weeks will probably exceed the peak recorded this year of 90,280 units assembled during the week ended April 22.

Electric power consumption and revenue freight carloadings during the week ended Oct. 7 receded slightly from the peak levels this year recorded in the preceding week. The decline in freight traffic to approximately 830,000 cars was less than seasonal. Power output receded less than 1 per cent below the preceding week's total and the decline is thought to be only temporary. A new all-time peak for this industrial indicator is confidently predicted within the next 30 days.

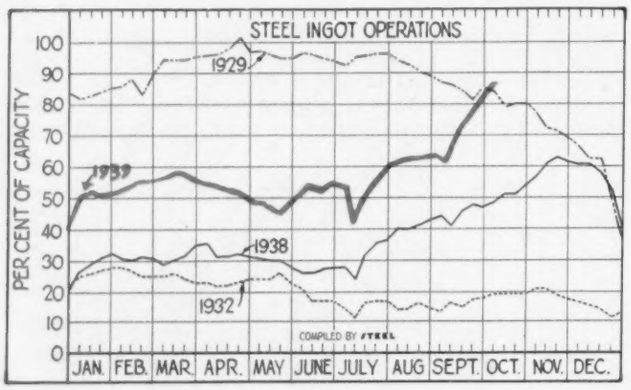
To what extent production is exceeding consumption can only be surmised. This situation should become clearer within the next few months.

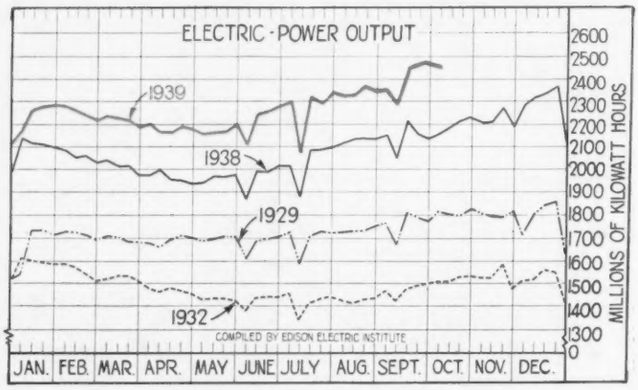
FINISHED STEEL SHIPMENTS UP SHARPLY

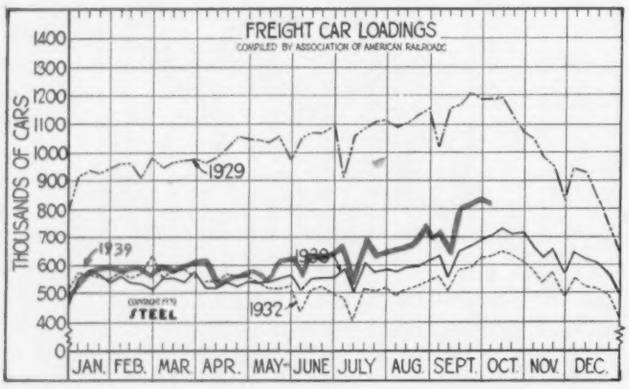
Shipments of finished steel products by the United States Steel Corp. during September amounted to 985,030 tons, the largest total since September, 1937. September shipments represented an increase of 181,208 tons over the August total of 803,822 tons. In September, 1938, shipments totaled 577,666 tons, and in September the previous year shipments aggregated 1,047,962 tons. In the September quarter shipments totaled 2,465,161 tons, against 2,158,057 in the second quarter and 2,235,209 in the initial quarter this year. For the nine months ended Sept. 30, shipments aggregated 6,858,427 tons, compared with 4,588,224 tons in the corresponding 1938 period.

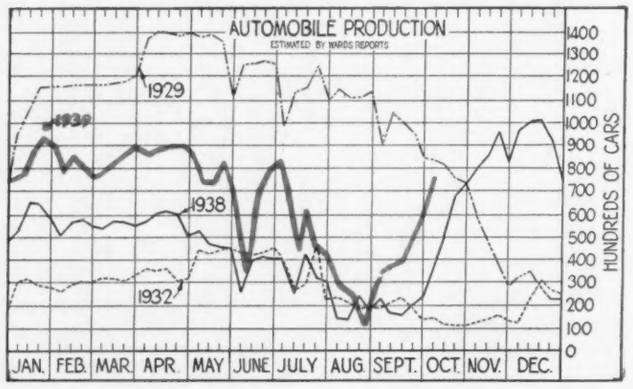
INGOT OUTPUT HIGHEST IN TWO YEARS

Steel ingot production during September increased 12.4 per cent to 4,231,310 tons. This compares with the September, 1938, ingot production of 2,647,129 tons. Output last month was at 72.41 per cent of theoretical capacity, compared with 62.22 per cent recorded during August and 46.09 per cent in September, 1938. Steelmaking operations during September were at the highest level since the comparable month in 1937, when total production was 4,301,869 tons. The daily average production during September likewise increased sharply to 169,252 tons, against the daily average of 139,386 recorded during August and 119,921 in September, 1938.



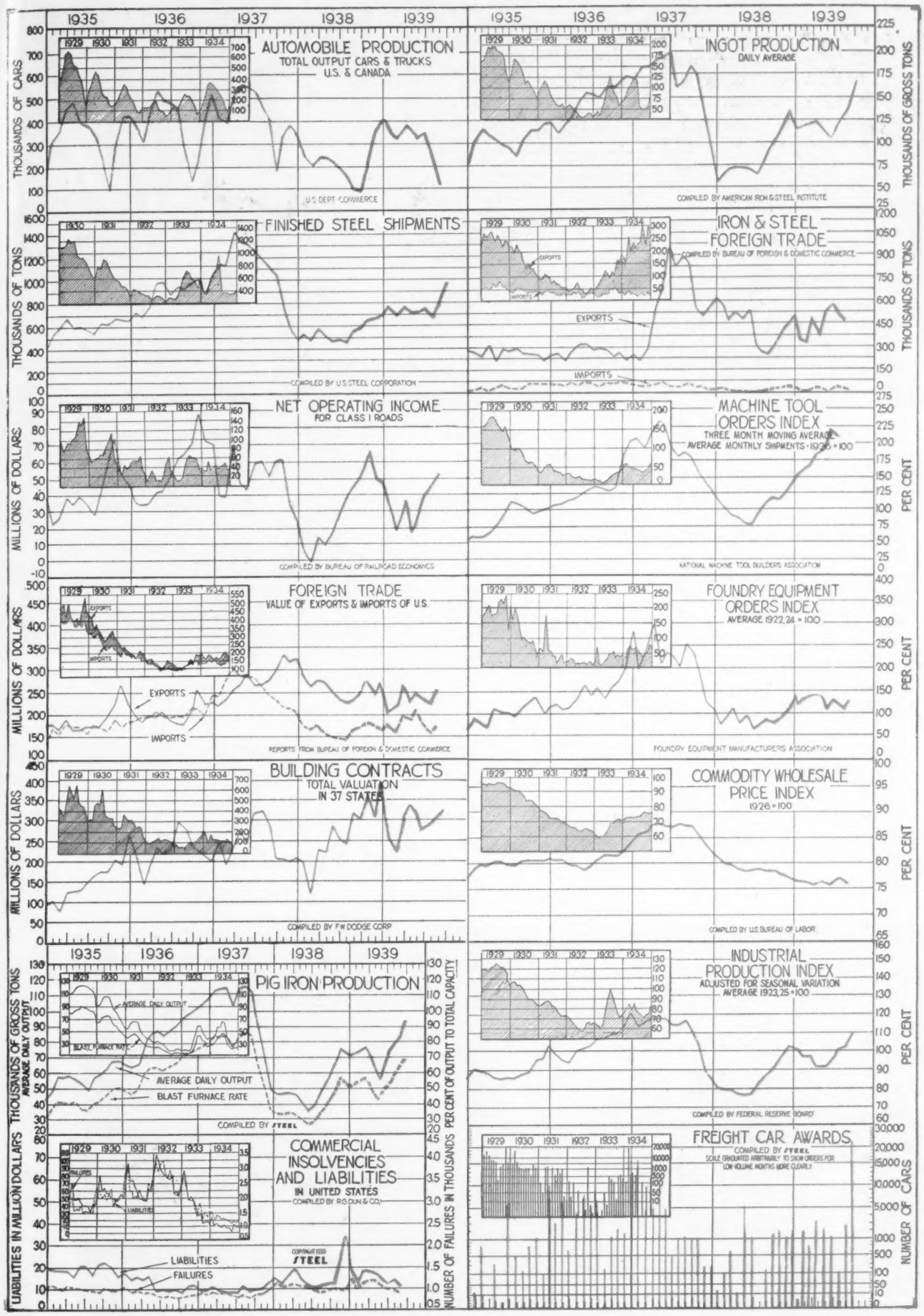


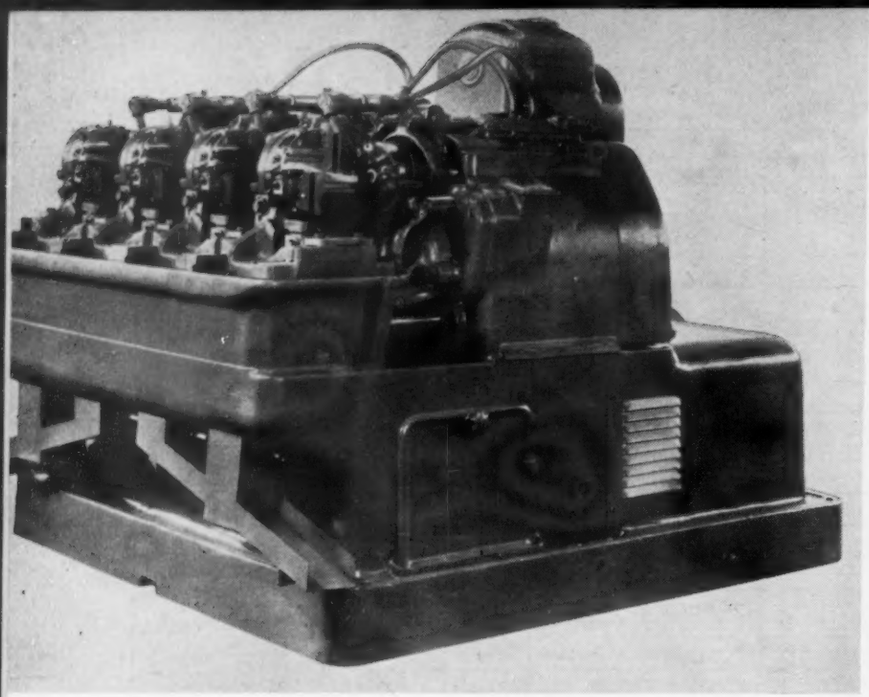


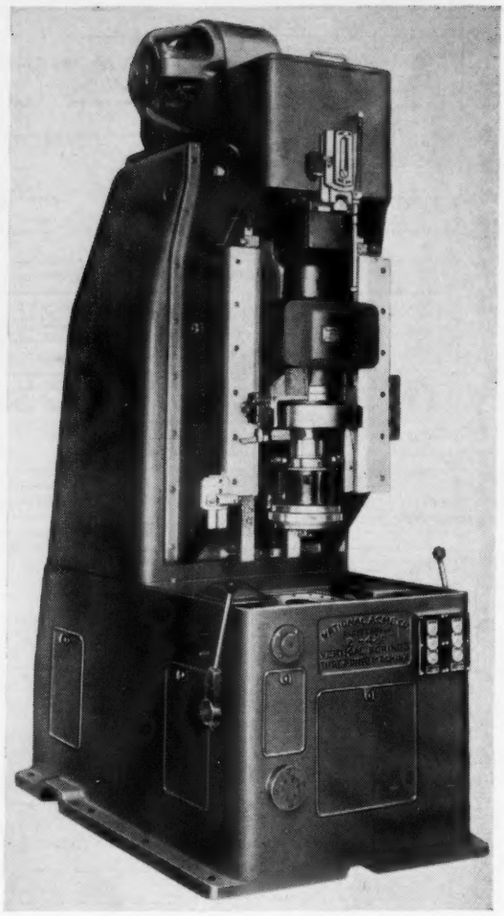


Week ending	Steelworks Operating Rate Per Cent 1939	1938	1932	1929	Electric Power Output Million KWH 1939	1938	1932	Freight Car Loadings Thousands of Cars 1929	1939	1938	1932	1929	Weekly Auto Output 1939	1938	1932	1929
July 1	54.0	28.0	14.5	93.0	2,300	2,015	1,456	1,592	666	559	480	909	70,663	40,945	40,291	98,746
July 8	42.0	24.0	12.0	95.0	2,078	1,881	1,341	1,712	559	501	416	1,065	42,784	25,375	26,560	113,586
July 15	50.5	32.0	15.5	95.5	2,234	2,084	1,415	1,727	674	602	504	1,079	61,610	42,010	29,870	115,075
July 22	56.5	36.0	16.5	96.0	2,295	2,085	1,433	1,723	657	581	502	1,101	47,420	32,070	46,375	123,512
July 29	60.0	37.0	16.5	96.0	2,342	2,094	1,440	1,725	660	589	511	1,104	40,595	30,390	22,461	110,163
Aug. 5	60.0	40.0	14.5	94.0	2,325	2,116	1,426	1,730	661	584	497	1,091	28,250	14,771	23,591	114,364
Aug. 12	62.0	40.0	14.5	93.0	2,333	2,134	1,415	1,733	661	589	512	1,100	24,875	13,790	21,162	111,939
Aug. 19	63.5	41.5	15.5	90.0	2,368	2,139	1,431	1,750	674	598	518	1,136	12,955	23,940	19,568	111,902
Aug. 26	63.5	43.5	14.5	89.0	2,355	2,134	1,436	1,762	689	621	538	1,160	18,365	18,700	19,896	113,316
Sept. 2	64.0	44.5	13.5	87.5	2,357	2,149	1,464	1,675	722	648	561	1,017	25,240	22,165	19,561	90,913
Sept. 9	62.0	41.5	15.5	86.0	2,290	2,048	1,423	1,806	667	569	501	1,153	26,865	17,485	21,586	104,351
Sept. 16	74.0	46.0	15.0	84.5	2,444	2,215	1,476	1,792	806	660	587	1,166	41,245	16,100	23,116	100,042
Sept. 23	79.5	48.0	17.0	82.0	2,449	2,154	1,490	1,778	815	676	596	1,202	53,950	20,390	19,327	95,453
Sept. 30	84.0	47.0	18.0	85.0	2,470	2,139	1,499	1,819	835	698	622	1,179	62,755	25,405	13.265	83.201
Oct. 7	87.5	48.5	19.0	84.0	2,465	2,154	1,506	1,806	830†	703	625	1,179	76,095	37,665	14,568	82,088

†Preliminary.


AUTOMOBILE PRODUCTION
TOTAL OUTPUT CARS & TRUCKS
U.S. & CANADA
U.S. DEPT. COMMERCE
INGOT PRODUCTION
DAILY AVERAGE
COMPILED BY AMERICAN IRON & STEEL INSTITUTE
FINISHED STEEL SHIPMENTS
COMPILED BY U.S. STEEL CORPORATION
IRON & STEEL FOREIGN TRADE
COMPILED BY BUREAU OF FOREIGN & DOMESTIC COMMERCE
EXPORTS
IMPORTS
NET OPERATING INCOME
FOR CLASS I ROADS
COMPILED BY BUREAU OF RAILROAD ECONOMICS
MACHINE TOOL ORDERS INDEX
THREE MONTH MOVING AVERAGE
AVERAGE MONTHLY SHIPMENTS-1925 = 100
NATIONAL MACHINE TOOL BUILDERS ASSOCIATION
FOREIGN TRADE
VALUE OF EXPORTS & IMPORTS OF U.S.
EXPORTS
IMPORTS
REPORTS FROM BUREAU OF FOREIGN & DOMESTIC COMMERCE
FOUNDRY EQUIPMENT ORDERS INDEX
AVERAGE 1922,24 = 100
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION
BUILDING CONTRACTS
TOTAL VALUATION
IN 37 STATES
COMPILED BY F.W. DODGE CORP.
COMMODITY WHOLESALE PRICE INDEX
1926 = 100
COMPILED BY U.S. BUREAU OF LABOR
PIG IRON PRODUCTION
AVERAGE DAILY OUTPUT
BLAST FURNACE RATE
COMPILED BY STEEL
INDUSTRIAL PRODUCTION INDEX
ADJUSTED FOR SEASONAL VARIATION
AVERAGE 1923,25 = 100
COMPILED BY FEDERAL RESERVE BOARD
COMMERCIAL INSOLVENCIES AND LIABILITIES
IN UNITED STATES
COMPILED BY R.G. DUN & CO.
LIABILITIES
FAILURES
COPYRIGHT 1939 STEEL
FREIGHT CAR AWARDS
COMPILED BY STEEL
SCALE GRADUATED ARBITRARILY TO SHOW ORDERS FOR LOW VOLUME MONTHS MORE CLEARLY
THOUSANDS OF CARS
THOUSANDS OF TONS
MILLIONS OF DOLLARS
THOUSANDS OF GROSS TONS
AVERAGE DAILY OUTPUT
PER CENT OF OUTPUT TO TOTAL CAPACITY
LIABILITIES IN MILLION DOLLARS
NUMBER OF FAILURES IN THOUSANDS
PER CENT
NUMBER OF CARS



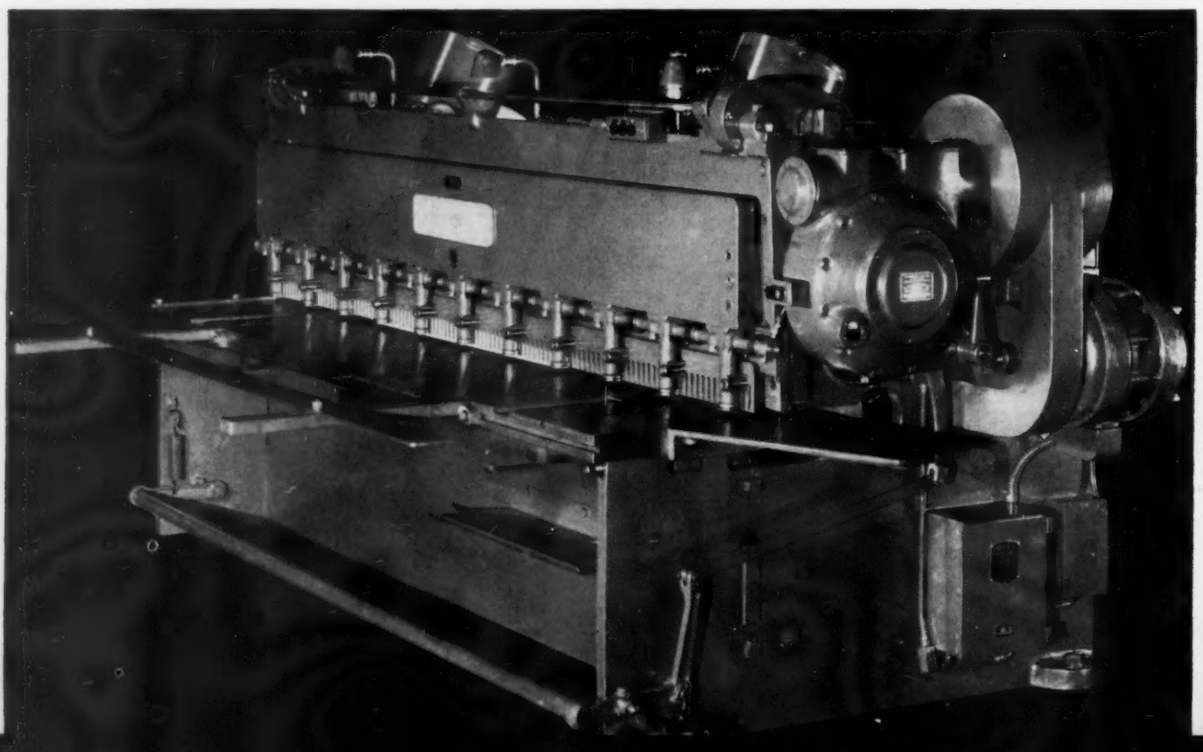


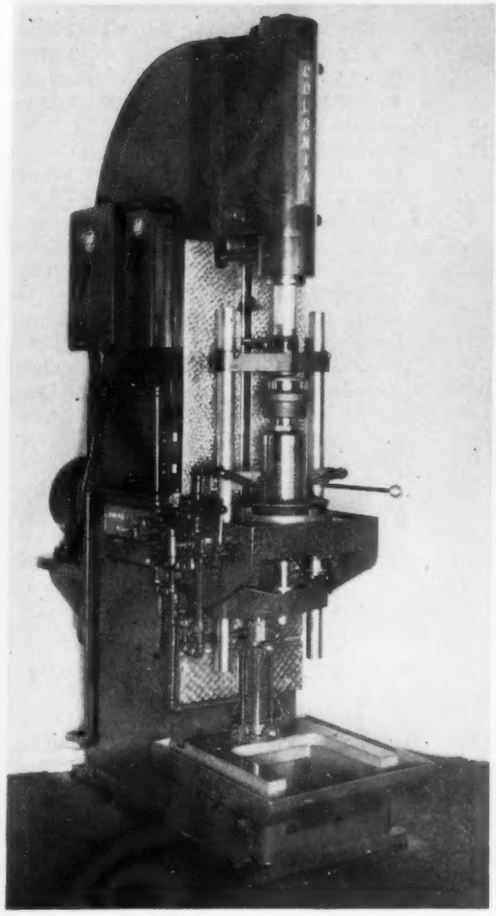
■ Landis 4-spindle semi-automatic threading machine, above, will handle almost any threading operation within its diametral capacity of 1/4 to 7/8-inch inclusive. Machine is equally adaptable for long rods, bolts, cap screws, etc. Landis Machine Co., Waynesboro, Pa.

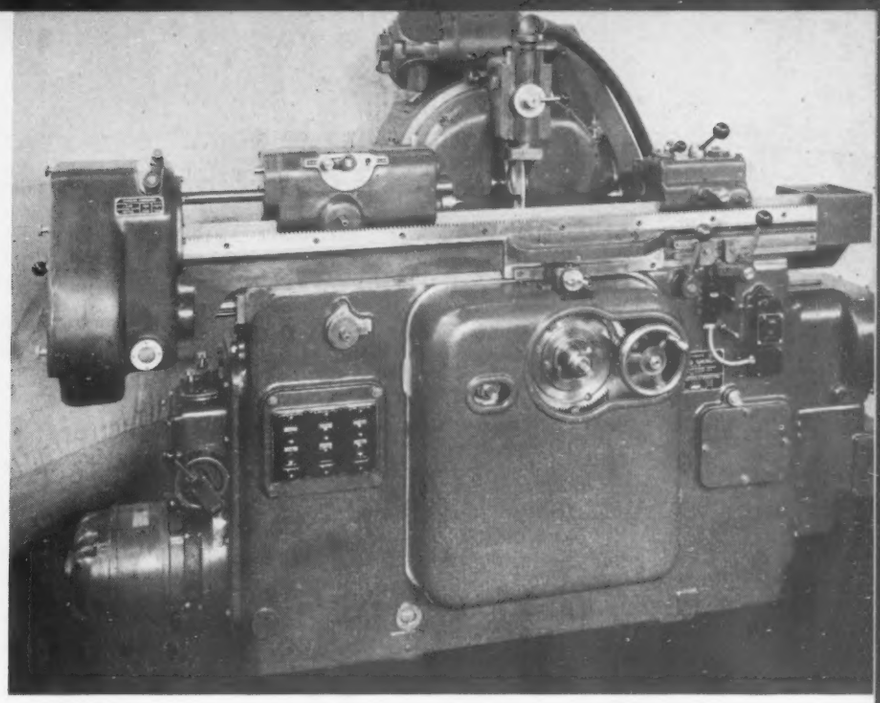
■ National Acme 4½-inch vertical boring and threading machine, at right, is equipped with a positive collapsing-receding circular chaser tap and a reversing table which maintains the principal concentric alignment of bores and threads. National Acme Co., 170 East 131st street, Cleveland

■ Cincinnati ½-inch x 12-foot all-steel shear, below, shears to micrometer tolerances at 60 strokes per minute. Hydraulic hold-downs automatically clamp any gage material with same pressure. Rapid gaging speeds up handling. Cincinnati Shaper Co., Hopple, Garrard and Elam streets, Cincinnati

VERSATILE





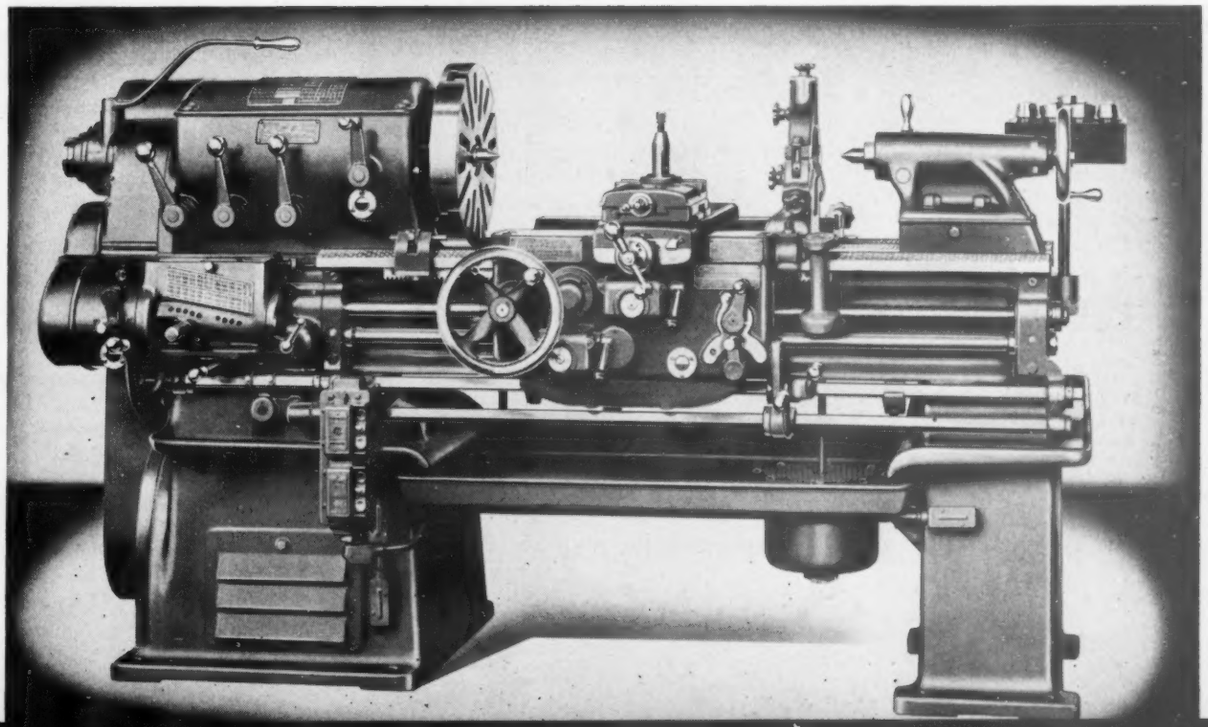


■ Jones & Lamson 6 x 36-inch automatic thread grinding machine, above, will grind threads up to 6½ inches in diameter using a 20-inch wheel. Machine will accommodate work 36 inches long between centers and will grind threads 12 inches long at one setting. Jones & Lamson Machine Co., Springfield, Vt.

■ Colonial Broach 10-ton open side utility press, left, is equipped with a 15-inch broach built up of individual rings to broach a hole two feet in circumference. Broach is guided at top and bottom throughout the stroke and has a cutting speed of 30 feet per minute and a return speed of 60 feet per minute. Colonial Broach Co., 147 Jos. Campau street, Detroit

New Machines

■ Reed-Prentice lathe, below, has 8 or 16 spindle speeds and complete automatic lubrication. Force feed lubrication on all ways. Lathe is built in 14, 16 and 20-inch sizes. Headstock of anti-friction construction. Reed-Prentice Corp., Worcester, Mass.



Correct application of wire rope guys involves consideration of traveling torsional waves produced in the guy by tension fluctuations. Prestressing just before installation and with recoiling or rereeling greatly improves service obtained from guys

Wire Rope On Modern Equipment

■ AS IT IS constituted today, wire rope is a strictly modern article. Its development has taken place without wide publicity, and for that reason the fundamentals with respect to wire rope qualifications and scope of adaptability perhaps are not clearly understood. Consequently, there appears some confusion of ideas as to where wire rope should be used and what results may be expected from its use. This confusion is reflected in much equipment sold and used today. It appears advisable to clarify certain fundamentals with respect to wire rope.

Primarily and fundamentally, wire rope is a flexible tension member of some mechanism in practically all cases. For example, it may be used for guying on a derrick, smoke stack, radio tower, etc. where its major function is to transmit tensile stresses between two points.

Secondly, use of wire rope may be compounded by adding to the static tensile stress the function of motion where the wire rope is required to lift loads, pass back and forth over various sheaves and to be wound upon drums as in mine hoists, boom ropes and main hoisting ropes for derricks, elevators, overhead traveling cranes, and operating ropes on tramways.

Wire Rope Withstands Shocks

A study of wire rope under tensile loads shows its modulus of elasticity is materially less, when taken as a completed structure, than the modulus of elasticity of the steel wire of which it is composed. The ability of wire rope to withstand shocks and sudden increases in loads is inversely proportional to the modulus of the completed wire rope. Consequently, wire rope may be used where variations of load are such that solid steel would not suitably withstand impact loads unless an exceedingly high factor of safety were used for the solid steel, much larger than would be required for wire rope.

All wire ropes stretch during their use. Even where used for guying purposes, some stretch takes place. This stretch is a natural phenomenon and should be considered in any application of any type of wire rope. The greater part of this stretch, where ropes pass over sheaves and drums, will take place in a few weeks as the rope becomes adjusted to its load. It is this stretch of a wire rope and increased elasticity with low modulus of elasticity that make wire rope so desirable for mechanical lifting and handling.

Because of bending and wear on moving wire ropes, attention of wire rope users has been focussed on longevity, reliability and low unit cost as periodic renewal is an ever present requirement.

Little attention has been paid to the consideration of stationary wire ropes used for guying purposes. In general, the least expensive rope construction has been used for guying on the supposition that a rope or strand containing the fewest number of wires and the largest diameter of individual wire was most economical. Such reasoning fails to take into account all phases of the situation.

Both wire ropes and strands used for guying, in addition to tension, are subjected to other stresses which are likely to have a bad effect on the life of guy ropes if overlooked, particularly where vibration is a factor. Where tensile loading fluctuates, a pulsating torsional wave results. It follows the helical contour of the rope lay from one end of the guy to the other. This traveling torsional wave is inherent in the rope structure itself, and when such vibrational waves reach the fastening on either end, the result is a dampening and stopping of the free travel of the pulsating wave. Cases have been known where ropes used for guying were cracked from end to end, due to this feature and failure to recognize it.

The following cases serve to point out the latent features which exist in certain forms of guying:

Case No. 1. Suppose a guy of ¾-inch diameter 7-wire (0.250-inch wire) construction is used. Such a strand would be stiff and hard to handle during installation, and would require solid and substantial sockets for end fastenings. A ¾-inch diameter 19-wire strand (0.150-inch wire) would be much better but would still be stiff. If a 49-wire rope of 7 strands, 7 wires each, were used, the wire size would be about 0.082-inch and the rope would be easy to handle and install.

Case No. 2. Consider a large guy, 4-inch diameter. The three rope constructions available are 6 x 37 with 7 x 7 wire center, 6 x 61 with 7 x 7 wire center, and 6 x 91 with 7 x 19 wire center. The approximate wire sizes are 0.190-inch, for 37 wires of the 6 x 37 rope; 0.147-inch for 61 wires of the 6 x 61 rope; and 0.121 inch for the 91 wires of the 6 x 91 rope. Either the 6 x 61 or 6 x 91 would give suitable resistance to vibration.

Ropes Twisted Twice

Wire ropes are twisted twice, once when the strand is constructed, and a second time when the rope is closed. Strands for guy ropes are usually left lay, and the rope right lay, making what is known as a regular lay rope.

This double twisting of wire rope produces a dampening effect in the rope which enables wire ropes to resist vibratory stresses more readily than strands alone, even if com-

posed of wires of approximately the same size. The relative length of lay of strands and ropes also is important. If lays are too long, the rope is too stiff and less resistant to vibratory stresses. This stability and long life of the more flexible types of guys are highly important and vitally necessary for radio towers, bridges, buildings and the like.

Repeated variation of tension on a guy cable or rope sets up torsional waves in the guy, frequently causing fatigue as evidenced by breaking of wires from no apparent cause.

It has been customary to guy the boom of large steam shovels back to the A-frame by multiple-reeved ropes passing over sheaves both in the A-frame and at the boom end. The designers assumed there would be little movement of the ropes over the sheaves. However, there is some movement of these ropes, due to stretch and to change of tension. As a consequence, these ropes often failed in a comparatively short length of time, 10 to 12 months.

Three causes were responsible; a slight movement of rope around sheaves; dampening of vibration at point of tangency to the sheaves; and the combination of these two effects over sheaves that were not designed large enough to permit the ropes to flex back and forth. To correct this, a single wire rope, 4 inches in diameter and of a flexible construction with an independent wire rope center, was used on each side. Prior to being installed, these were prestressed at the factory for more than a day with a socket on each end, under a load of approximately 800,000 pounds. End fastenings were especially designed so the load pull would be centered perfectly at all times.

Behavior of these large flexible guys was entirely satisfactory. Variations of the fluctuations in load on these mammoth shovels now causes no motion of any sort in the wire rope except a slight extension and contraction incident to the modulus of the ropes themselves. Torsional vibration is entirely absent. Other vibrations are taken care of by the fact that the ropes are extremely flexible and have been prestressed to a point far in excess of loads applied in operations of the shovel.

While prestressing of bridge strands and suspender ropes has been employed for several years, it is only recently that the reason for certain behavior of guy strands and ropes has been recognized. The prestressing of all important guy ropes has now become a recognized necessity, just as prestressed bridge ropes are now used entirely. Where guy tensions are subject to fluctuations in load, it is necessary to prestress these guy ropes to about 50 per cent of the ultimate strength until the rope attains its maximum modulus. Then any stress applied to the prestressed guy will cause only elastic extension and contraction free from rotative effects. It is customary to paint a stripe longitudinally along the guy from one end to the other as an aid to prevent twisting or turning of the guy away from its true path during installation.

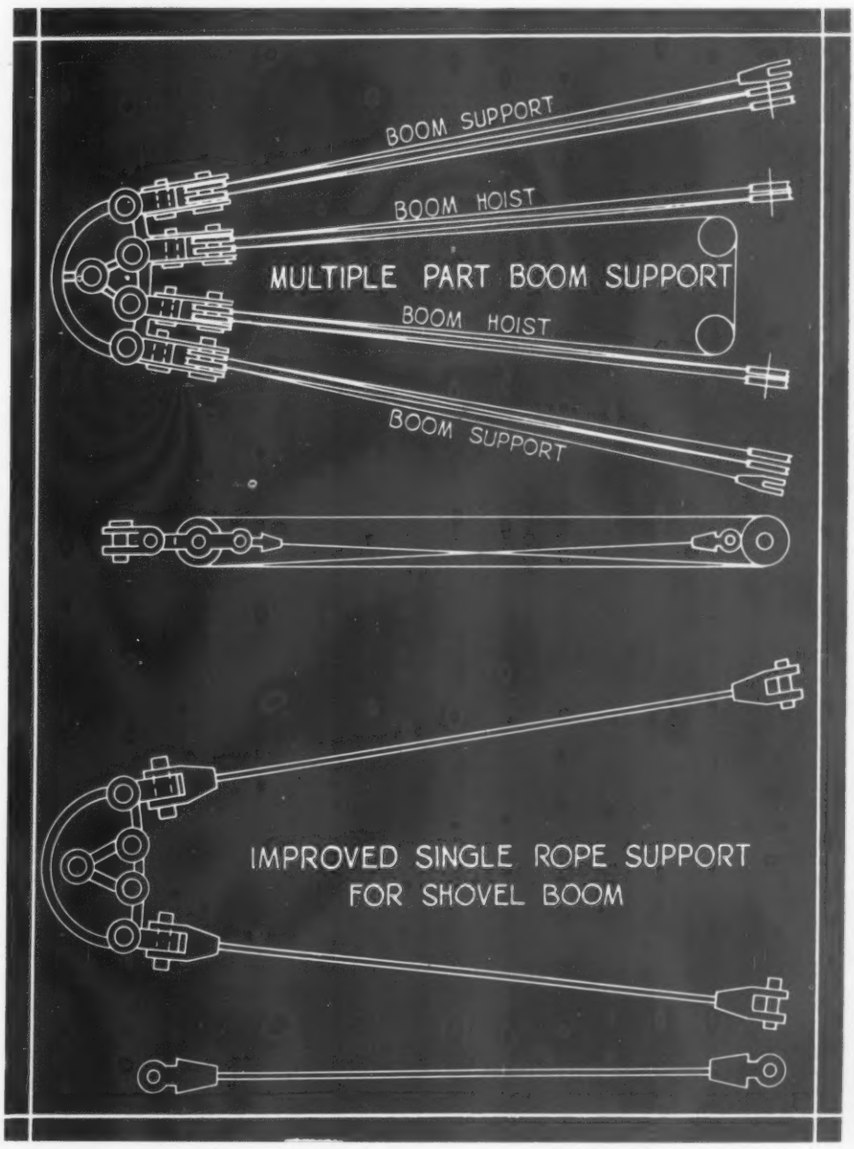
Proper Tensioning Possible

The improvement in service has been remarkable and has demonstrated effectively that the points discussed with respect to guys need to be taken into consideration. The solution of this problem and the excellent results obtained are defi-

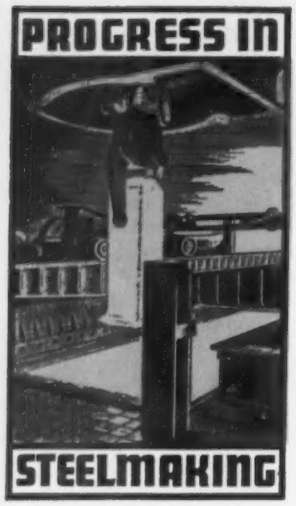
(*Please turn to Page* 74)

Guys

By **JAMES F. HOWE**
Wire Rope Engineer
American Steel & Wire Co.
Worcester, Mass.



Upper pair of diagrams show plan and side view of multiple part boom support design which gave trouble due to short life of cables. Below is plan and side view of simplified arrangement utilizing large 4-inch wire ropes which are found to give long life with no vibration under load

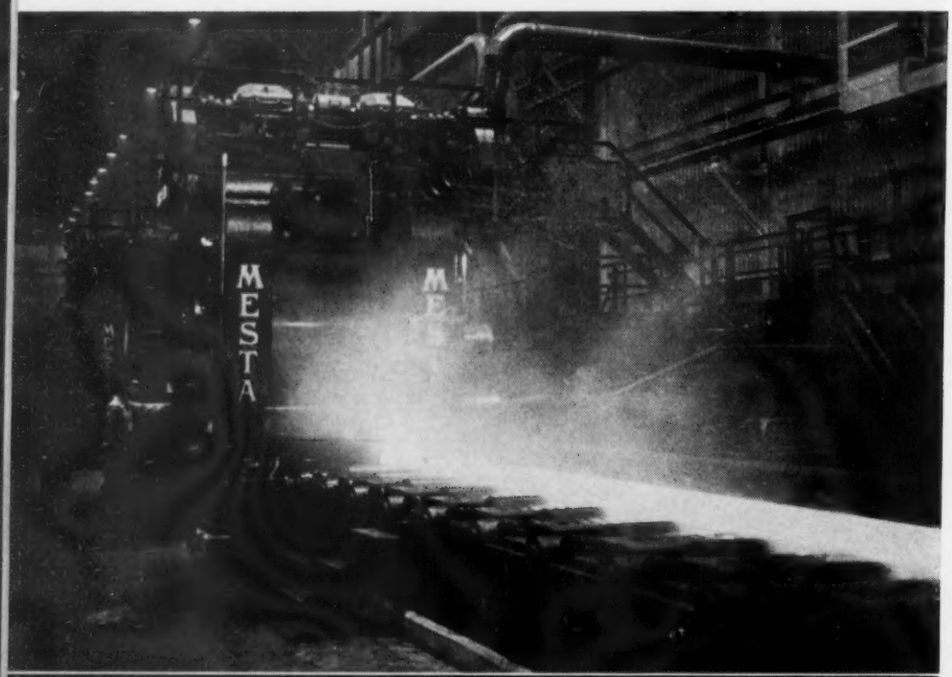


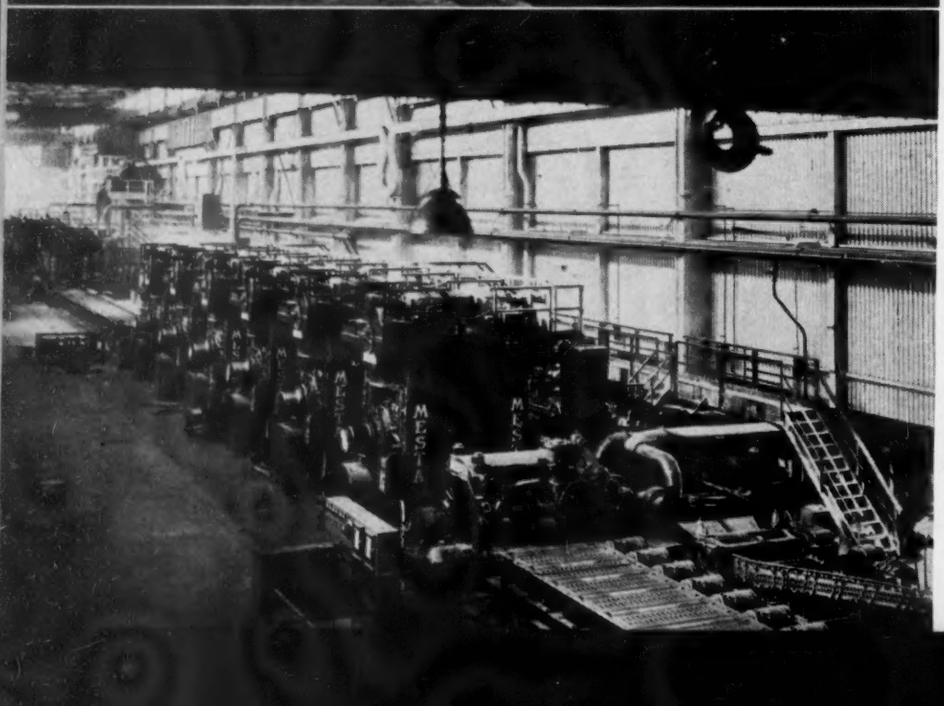
New Continuous Strip Mill

Important additions to Chicago district capacity includes 1,044,000 gross tons annually from new 54-inch hot mill and 180,000 tons from new 48-inch cold mill. Latter unit employs 8900 horsepower, with finish speed of 2000 feet per minute

By E. F. ROSS
Engineering Editor, Steel

Part I





WITH a $16,500,000 modernization program nearly completed at its Indiana Harbor, Ind., plant, Youngstown Sheet & Tube Co. becomes a producer of hot and cold-rolled strip and sheets in the Chicago district, and at the same time materially increases its productive capacity for tin plate. Under way for nearly a year, the program involved principally installation of a 54-inch continuous hot strip mill with cold rolling facilities, rebuilding of the 35-inch blooming mill to a 46-inch unit, construction of a new 165-ton open hearth furnace and extensive improvements to existing open-hearth equipment.

The new continuous strip mill gives the plant a hot finished capacity of 87,000 gross tons per month, or 1,044,000 tons annually. This is based on monthly operation of 26 days, 24 hours a day, and an output of 70 tons per hour from the slab heating furnaces. Capacity of the new cold rolled department is 15,000 tons a month, or 180,000 tons per year. With an output of 7000 tons a month, or 84,000 tons per year, from the two reversing cold mills, constituting existing equipment, cold rolled capacity totals 22,000 tons per month, or 264,000 gross tons annually.

Since the new continuous mill becomes an integrated part of the ex-

Upper, view from delivery side of hot mill roughing stands. Lower, finishing end of hot strip mill showing sections of runout table and roller twist guide to vertical coilers. This also shows flying shears and general view of mill

differences turn to dollars..

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isting tin mill, it is located immediately north of the tin mill and in newly constructed buildings. This construction includes a new slab yard, mill motor room, hot strip mill building, continuous pickle building, and a seven-day extension to the present cold mill building to house the new 5-stand tandem cold mill. These buildings are of all-steel construction with corrugated roofing and siding, so designed as to provide good ventilation. Hot strip finishing now is in former hot mill building from which 24 hot tin mills were removed.

The slab yard is 94 feet wide and 624 feet long and is served by two 25-ton overhead cranes, one a new unit and the other a unit transferred from the old blooming mill. Here slabs delivered from the bloomer by railroad car are deseamed either by pneumatic chippers or oxyacetylene scarfing torches. Slabs are loaded into two magazine-type pushers and pilers which charge them into two slab heating furnaces.

These furnaces, located at the west end of the slab yard and discharging heated slabs into the hot mill building, are each 18 feet wide and 85 feet long. Using oil as fuel, but equipped to be switched to gas, they are five-point fired and are provided with complete temperature controls. Normal capacity of these furnaces is 60 tons per hour—maximum 80 tons, this capacity being based on heating 16-foot slabs 6 inches thick from cold to 2250 degrees Fahr.

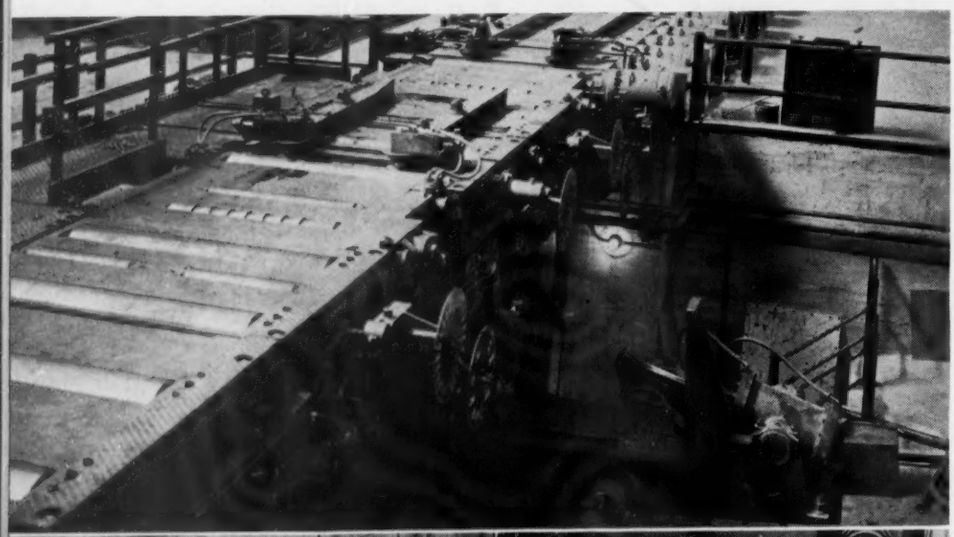
The 54-inch hot strip mill has ten stands and will roll strip from 8 to 52 inches wide down to 20 gage. It consists of a 2-high, 40 x 54-inch breakdown mill; three 4-high roughing stands, the first 24½ and 45 x 54 inches, the second and third 22½ and 45 x 54 inches, and all equipped with vertical edgers; and six 4-high finishing stands with rolls 22½ and 45 x 54 inches.

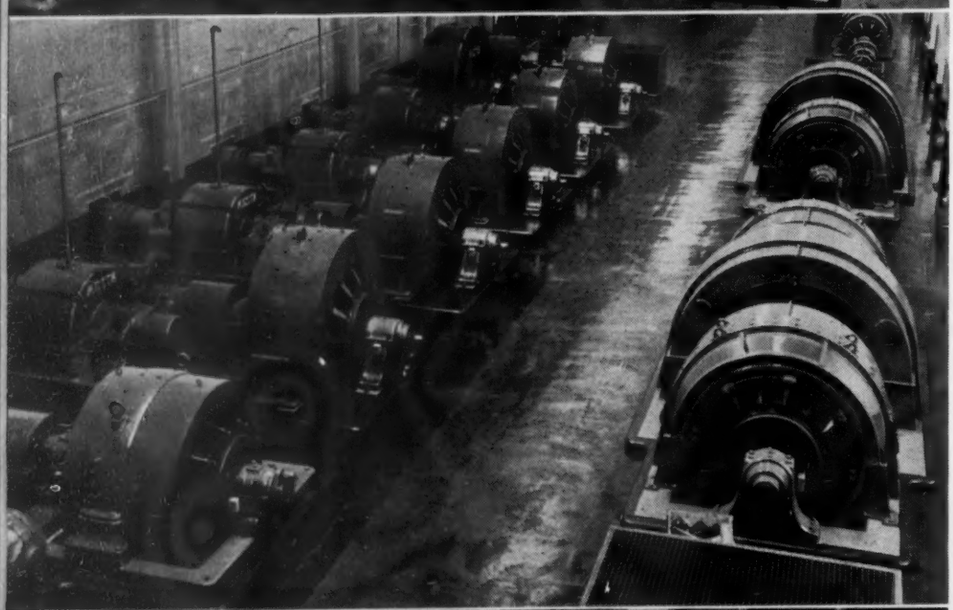
Heated slabs pass first through a scale breaker of the vertical edger type driven by two 300-horsepower, 2200-volt, alternating-current motors of 514 revolutions per minute, then to the 2-high breakdown mill whose main drive is a 3000-horsepower, 2200-volt, 60-cycle synchronous motor operating at 144 revolutions per minute. This stand gives the slabs a 50 per cent reduction. The three roughing stands are driven by 2500-horsepower, 2200-volt, 60 cycle induction motors, the first running at 240 revolutions per minute, the second and third at 257 revolutions. Vertical edgers accompanying these three roughing stands are powered by 150-horsepower continuous, 230-volt, direct-current motors of 460 to 1150 revolutions per minute.

Rotary Stationary Crop Shear

Before entering the first of the six finishing stands, the strip passes through a 2-high, 25½ x 54-inch scale breaker and a rotary stationary crop shear. The scale breaker is driven by a 500-horsepower, 600-volt, direct-current motor of 150 to 600 revolutions per minute. The crop shear is driven by a 75-horsepower, 230-volt, direct-current motor of 515 to 1030 revolutions per minute.

The first five finishing stands are driven by 3000-horsepower, 600-volt, direct-current motors operating at 200 to 400 revolutions per minute.





Top, runout table and flat strip cooling skids. Also part of coilers are visible in lower center. View is looking toward finishing stands of hot strip mill. Center, main motor room showing hot mill finishing stand drives in left foreground with motor-generator sets at right. Hot mill roughing drives at rear. Bottom, here the arrangement of continuous pickling lines can be seen with uncoiling processers and welders in the foreground at entering end of lines

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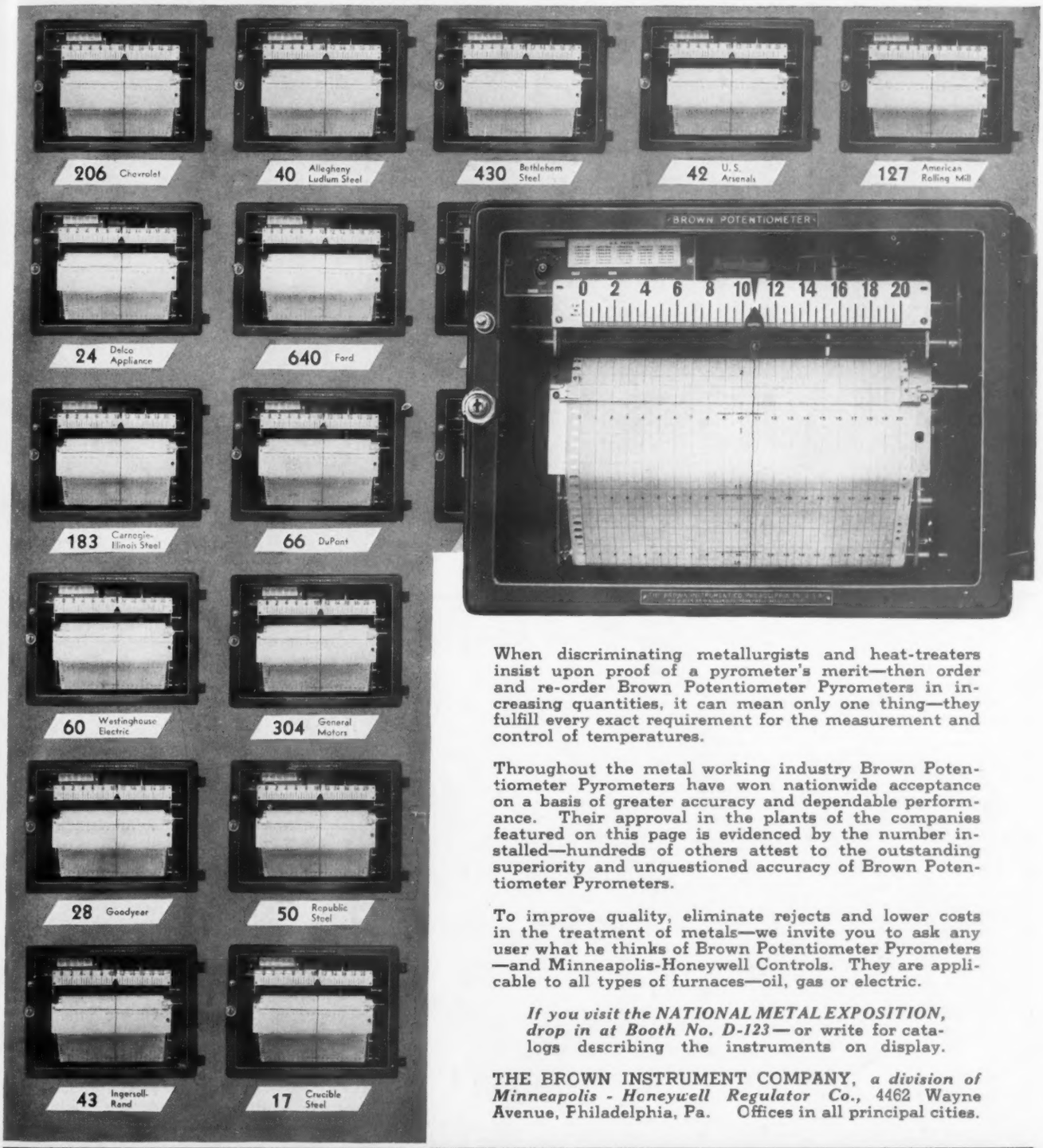

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Leaving the finishing stands, strip goes to a rotary flying shear with crop disposal equipment. Strip to be coiled has only its ends cropped. When flats are to be produced, the shear cuts the strip in lengths ranging from 13 feet 9 inches to 56 feet. Shear has a power-operated clutch changing device controlled from the operator's side of the mill. To facilitate removing cobbles, the shear roll is provided with a hinged arrangement. Two 150-horsepower, 230-volt, direct-current motors of 460 revolutions per minute drive the shear.

Direct current at 600 volts for operation of the mill finishing stands is supplied by two motor-generator sets each having two 3000-kilowatt generators. These are driven by a 8400-kilovolt-ampere, 11,000-volt, 60-cycle, synchronous motor running at 360 revolutions per minute.

Operator's control desk and auxiliary controls for the hot mill are located on two connected balconies paralleling the mill stands. Grease lubrication systems are provided for roll necks, mill screws, crop shears, flying shears and runout table rollers; oil lubrication systems for gears and bearings of reduction sets, gears and bearings for mill pinions and backing-up roll neck bearings. Mills are equipped with a hydraulic spray system, two pumps supplying 1000 gallons of water per minute at a pressure of 1150 pounds per square inch. Two overhead traveling cranes serve the hot mill building.

Vertical Coiling Unit

At the end of the direct-current runout table and 400 feet beyond the last hot finishing stand are two coilers; both of these are horizontal units and in line with the runout table, and handle the wider widths. Obliquely to the runout table, feeding the two down coilers, a third table or apron conveyor is used for a vertical coiling unit and strip is diverted to it by a vibrator and the apron conveyor. The latter coiler handles material from 8 to 44 inches wide, 10 to 20 gage, and in maximum coil weights up to 7000 pounds.

From these two coilers, the coils are transferred to the coil storage building on a conveyor. The coil storage building is 93 feet wide and 744 feet long and has two 15-ton cranes. The building is served by railroad tracks to permit shipment of coiled hot strip to customers, also is equipped with tilters, conveyors and elevators for taking coils to the hot strip finishing department as well as conveyors and tilters for delivering coils to the continuous pickle lines.

The pickle building, 65 feet wide and 675 feet long and paralleling coil storage on the north, is served by a 10-ton crane. The continuous pickling lines are installed, one to handle up to 38-inch strip, the other 51-inch material. Room is available for a third line for 38-inch strip.

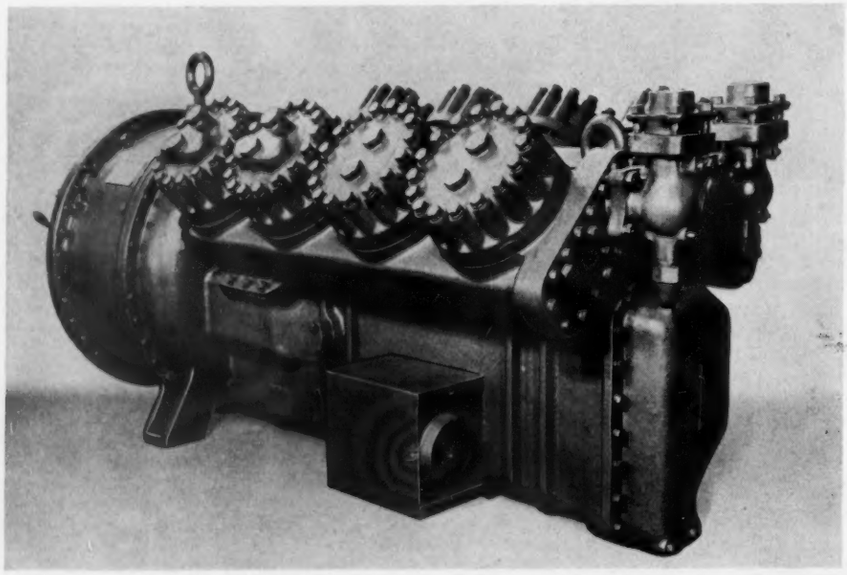
Delivered to the uncoiler, strip is flexed sharply over a small-diameter roll as it leaves the coil to prepare the surface for rapid, clean pickling and eliminate possibility of coil breaks. It feeds forward through an up-cut shear to an electric butt welder, or a stitcher, which joins coil ends for continuous pickling. Pinch rolls convey strip through a wash pit, then through four rubber-lined, brick-faced acid tanks, a cold and hot rinse and out to the dryer.

Looper pits at both ends of the pickling lines permit continuous movement of the strip through the tanks while welds or stitches are being made or cut out. An upcut shear at the exit end removes the welds or stitches, if desired. Material is recoiled, weighed and tilted on a trough-type gravity roll conveyor. From the conveyor discharge table, the coils are moved to storage or to the cold reduction mills by tractor.

Metal parts in the pickling line exposed to acid or fumes are protected by an exhaust system which removes fumes and steam. Rubber tank linings are protected against abrasion by acid-resisting brick. Indicating and recording instruments keep a record of temperatures and strip speeds, and a constant watch is maintained over the strength of acid solutions.

(Concluded next week)

Air Conditioning Compressor Offers Advantages



■ **New high-speed, 100-ton, 16-cylinder air conditioning compressor developed by air conditioning division, Westinghouse Electric & Mfg. Co., East Springfield, Mass., weighs only 4200 pounds with overall 90-inch length, 34-inch width and 36-inch height. Refrigerant-cooled motor requires no external ventilation. Maintenance expense is reduced by the hermetically sealed design, with motor and compressor on a common crankshaft. Reversible oil pump provides positive lubrication regardless of direction of rotation. Entire operating mechanism can be exposed by removing side plates. It is intended for use in textile, tobacco and other industrial plants**

Rack Coating Material

■ A rack coating material containing a high percentage of solid matter and claimed to be unaffected by boiling cleaners or plating solutions, including chromium, has been marketed under the name of Unichrome Rack Coating-W by United Chromium, Inc., 51 East Forty-Second street, New York. White in color, it leaves uncovered portions of racks plainly visible. In coating, rack is dipped in solution and then force dried for an hour at about 200 degrees Fahr. Ten coats are usually applied.

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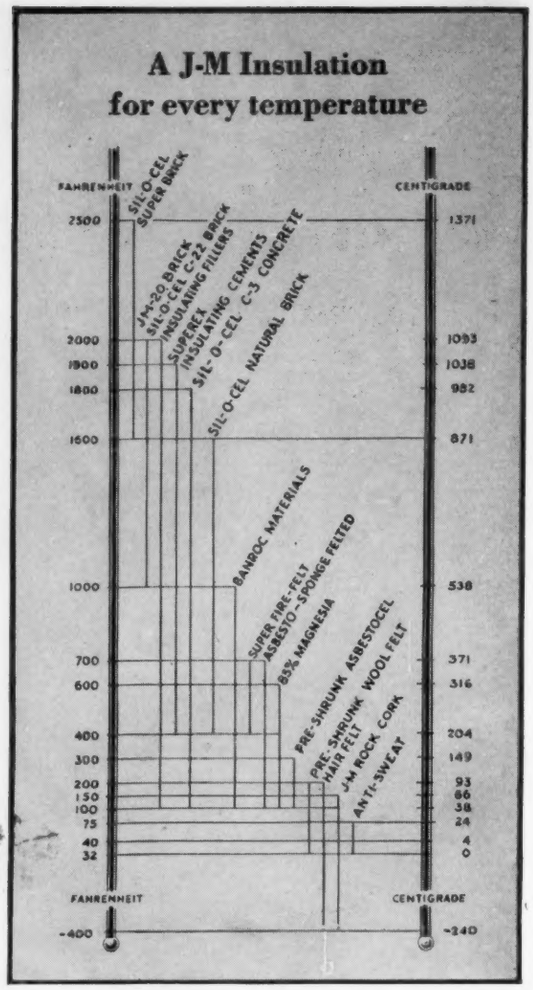

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Hundreds of plants all over the country have used this helpful J-M Service to secure better temperature control . . . maximum fuel savings. Why not let a trained J-M Engineer make a complete study of your requirements? For full details and complete information on J-M Industrial Insulations, write for Brochure IN-55-A. Johns-Manville, 22 East 40th Street, New York City.

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For every temperature . . .
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Multiple Spot Welding

Extremely high electrode pressures and short welding period permit welding large spot welds in stainless steel evaporator chambers with no sparking or burning. Welded units withstand internal pressures up to 600 pounds per square inch in tests

■ AN INNOVATION in the multiple spot welding of stainless steel, involving development of special equipment, was recently placed in operation at Grand Rapids, Mich., refrigerator plant of Nash-Kelvinator Corp.

Applied for the first time to welding the evaporator chamber of Kelvinator refrigerators, the process produces spot welds whose length is ten times the thickness of the metal. See Fig. 2 for cross section. This compares with normal practice of a maximum of three times the gage of material.

The work is done without burning or sparking. Evenness and uniformity of welds characterize the operation, even though four to six spots (depending on the size of the evaporator chamber) are welded simultaneousy. There are a total of some 320 spot welds for each chamber.

Equipment Specially Designed

The process and equipment were developed by Progressive Welder Co., 737 Piquette avenue, Detroit, specifically to meet problems involved in welding evaporator chambers. This chamber comprises two sheets of stainless steel, formed in such a manner as to provide multiple passages for the vaporizing refrigerant. The surfaces of the chamber absorb heat from the surrounding atmosphere in accordance with the latent heat of vaporization of the refrigerant, as the latter traverses the chamber passages.

To prevent oxidation inside or out and for maximum cooling efficiency and trouble-free service, 18-8 stainless steel 0.025-inch thick is used. To pass inspection, the finished evaporator chamber must be capable of resisting without failure a pressure of about 600 pounds per square inch on test.

The problem involved was to obtain throughout the chamber uniform spot welds of a size sufficiently large to withstand these high pressures. Yet burning or arcing during the operation had to be prevented. Any sparking between the sheets would form small particles of oxides which would tend to dam-

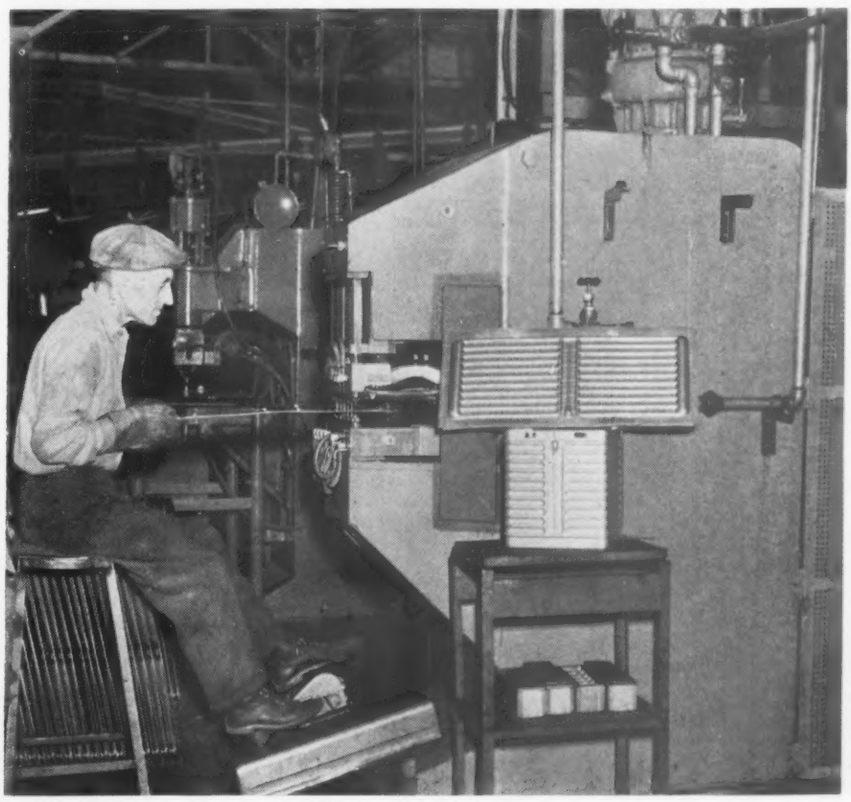
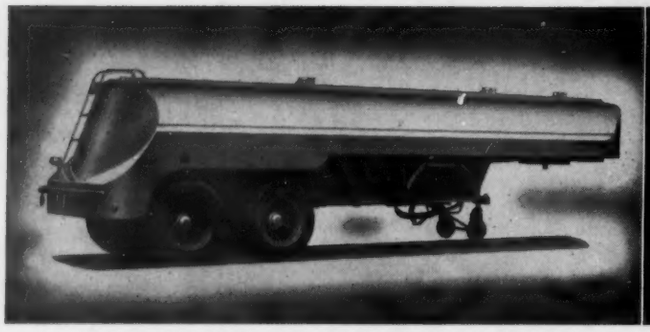
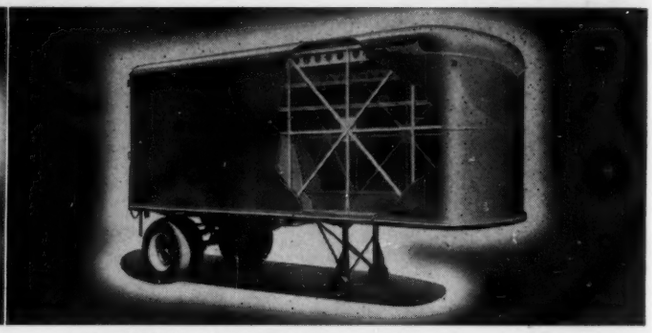


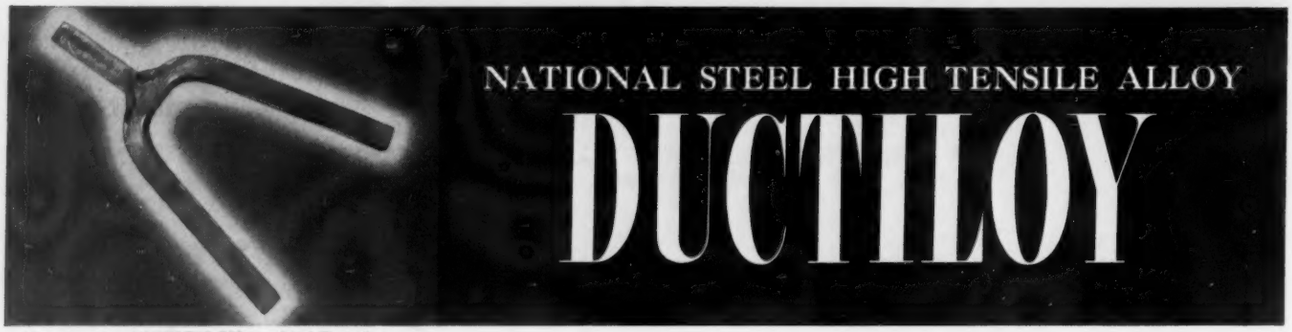
Fig. 1—Pressures of 1000 pounds per square inch and only three cycles of welding current, controlled automatically, provide uniform welds without sparkling or burning on this welder. On table are stainless steel evaporator chambers after welding, and after cleaning and forming



4,000 gallon tank made entirely of DUCTILOY, by Independent Metal Products Co., Omaha, Neb.



Fruehauf Trailer Co., world's largest truck-trailer manufacturers, uses DUCTILOY.



Test sample of DUCTILOY—welded T section (as welded) cold bent after welding, showing ductility and weldability.

Tensile Properties* of DUCTILOY

.505 Diameter Test Specimen

Temp. of Test	Yield Point p.s.i.	Tensile p.s.i.	Elongation % 2" Elong. at Yield Pt.	Elongation % 2" Total Elong.	Elongation % 2" Uniform Elong.
-126°F.	68,500#	90,500#	2.56	36.0	20.3
70°	63,000	83,000	1.82	34.5	19.6
100°	62,300	82,600	—	37.0	—
200°	54,500	80,000	—	36.5	—
300°	53,000	76,550	1.18	35.0	20.6
400°	58,100	78,600	0.992	36.5	20.0
500°	50,500	76,250	1.15	31.5	20.0
600°	51,500	76,000	0.686	31.5	19.7
700°	55,500	78,000	—	30.5	18.3
800°	51,500	80,000	—	32.5	18.4
900°	51,500	81,000	—	34.5	18.1
1000°	39,000	74,250	—	34.5	12.3
1100°	23,000	36,500	—	44.0	11.8
1200°	19,500	25,750	—	54.5	5.0
1300°	15,000	17,000	—	60.5	3.7
1400°	10,000	10,450	—	70.5	0.0

* The physical properties vary, of course, somewhat with the size and shape of the section rolled, as noted in the various pamphlets dealing with DUCTILOY, and can be furnished with high strength and good ductility or lower strength and extra high ductility.

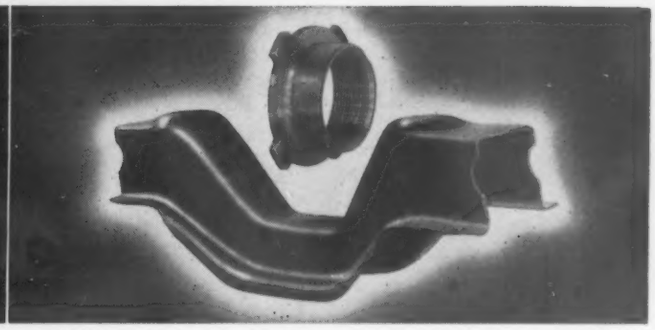
CHARPY IMPACT RESISTANCE KEYHOLE TYPE SPECIMEN

Temp. of Test	Foot Lbs.
75°F.	51.5
50°	45.5
25°	42.2
0°	37.4
-25°	35.7
-100°	7.8

DUCTILOY FEATURES

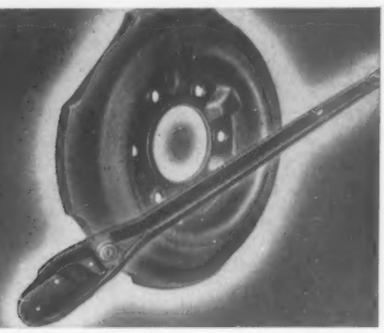
- Unusual Ductility
- Good Formability
- High Yield Point
- High Ultimate Strength
- High Resistance to Impact and Fatigue
- Excellent Weldability
- Marked Resistance to Corrosion and Abrasion

DUCTILOY—with its unusual ductility and resistance to fatigue and impact—is well suited for use in modern high speed streamline trains.



Difficult automotive parts cold-formed with DUCTILOY—evidence of unusual ductility.

A superior high tensile steel with outstanding properties of interest to every metallurgist, engineer and production man.



Typical stampings illustrating the unusual ductility and cold forming properties of DUCTILOY.

DUCTILOY was developed to fill a definite need on the part of high tensile steel users. This need was for ductility, or workability, without which high tensile properties, in many applications, were of little practical value.

That DUCTILOY fills this need—completely and satisfactorily—is evidenced by the widespread and rapidly growing number of applications for which DUCTILOY is being successfully used today, some of which are illustrated here.

DUCTILOY not only has unusual ductility, but it has these other important properties as well—high yield point, high resistance to fatigue and impact, excellent forming properties, exceptional weldability, and marked resistance to corrosion and abrasion.

Metallurgists, engineers and production men have been quick to realize the superiorities of DUCTILOY; their own tests have confirmed the claims made for it; and results, in actual applications, have won their enthusiastic and wholehearted endorsement.

Why not investigate DUCTILOY for your requirements? Our engineers will consult with you in adapting this high tensile, high-ductile steel to your special needs.

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NATIONAL STEEL CORPORATION

age the working parts if they entered the compressor chamber. Any burning would destroy the stainless qualities of the steel at the weld and thus would provide an excellent starting place for corrosion.

Six Welding Heads

The machine developed to meet these requirements is shown in Fig. 1. In reality, this multiple spot welder comprises six separate welding heads which operate simultaneously, each with its own tranformer. The use of six individual transformers, for current and voltage regulation, eliminates the current unbalancing effect of induction in some multiple spot welding machines. It is arranged so individual welding tips and their transformers can be cut out to permit chambers of different sizes to be welded on the one machine. In Fig. 3, the machine is shown welding only four spots at a time, the two end electrodes not contacting the work and their transformers being disconnected.

As far as welding itself is concerned, the two major points of difference from conventional spot welding are the unusually high welding pressures and short welding time employed. Hydraulic welding pressure is provided by a self-contained air-hydraulic booster shown on top of the machine in Fig. 1.

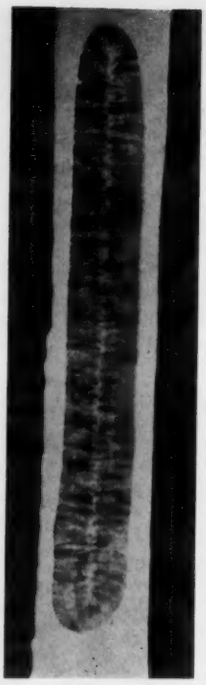


Fig. 2—Micrograph of finished spot weld, magnification 13 diameters. Note completeness of weld, retention of original condition of metal, and extremely large spot (approximately ¼-inch in diameter) in proportion to thickness of metal

It is set at 1500 pounds welding tip pressure. compared with normal spot-welding pressures of 300 to 500 pounds.

This high pressure is largely responsible for preventing any trace of sparking. Incidentally, Kelvinator is getting better than half a million spots per welding tip without removing the points. Partially responsible for this probably is the fact that the welding tips are designed to run cold. Their low temperature is used to reduce the temperature of the welded metal immediately after the weld, the tips being held in contact with the work for a short interval after completing the weld.

The delay release used to do this is adjustable and its control forms part of the Weltronic timer used in connection with the machine. These timers permit accurate adjustment of the automatic control for each step of each weld. For welding the evaporator chamber, time of current application is set to only 3 cycles. This rapidity of weld also assists in prevention of burns on the material.

Leaves Unmarked Surface

As a matter of fact, the only evidence of the weld externally is a glazing due to the high pressures. This disappears when evaporators are cleaned before assembly into the unit. In cleaning a bath is used which is slightly acid. It leaves an unmarked surface.

In operation, the machine is quite rapid. The operator inserts a chamber (previously tack welded) to correct position for the first group of welds. Depressing the foot pedal control starts the timer and machine through an ignitron control. Tips are brought into contact under pressure, current is turned on and off, pressure is released after the "cooling time" delay and electrodes separate to permit the operator to shift the work to position for the next series of spots. The cycle then automatically repeats. If the operator desires, he can interrupt the auto-

(*Please turn to Page* 98)

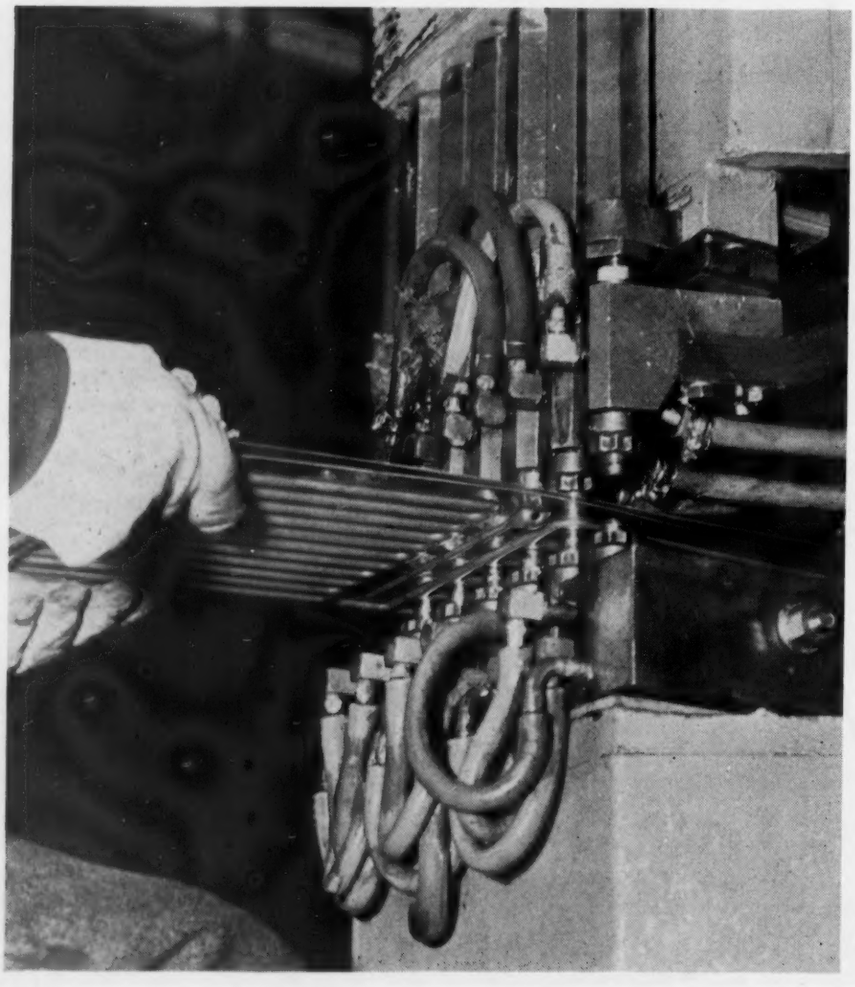
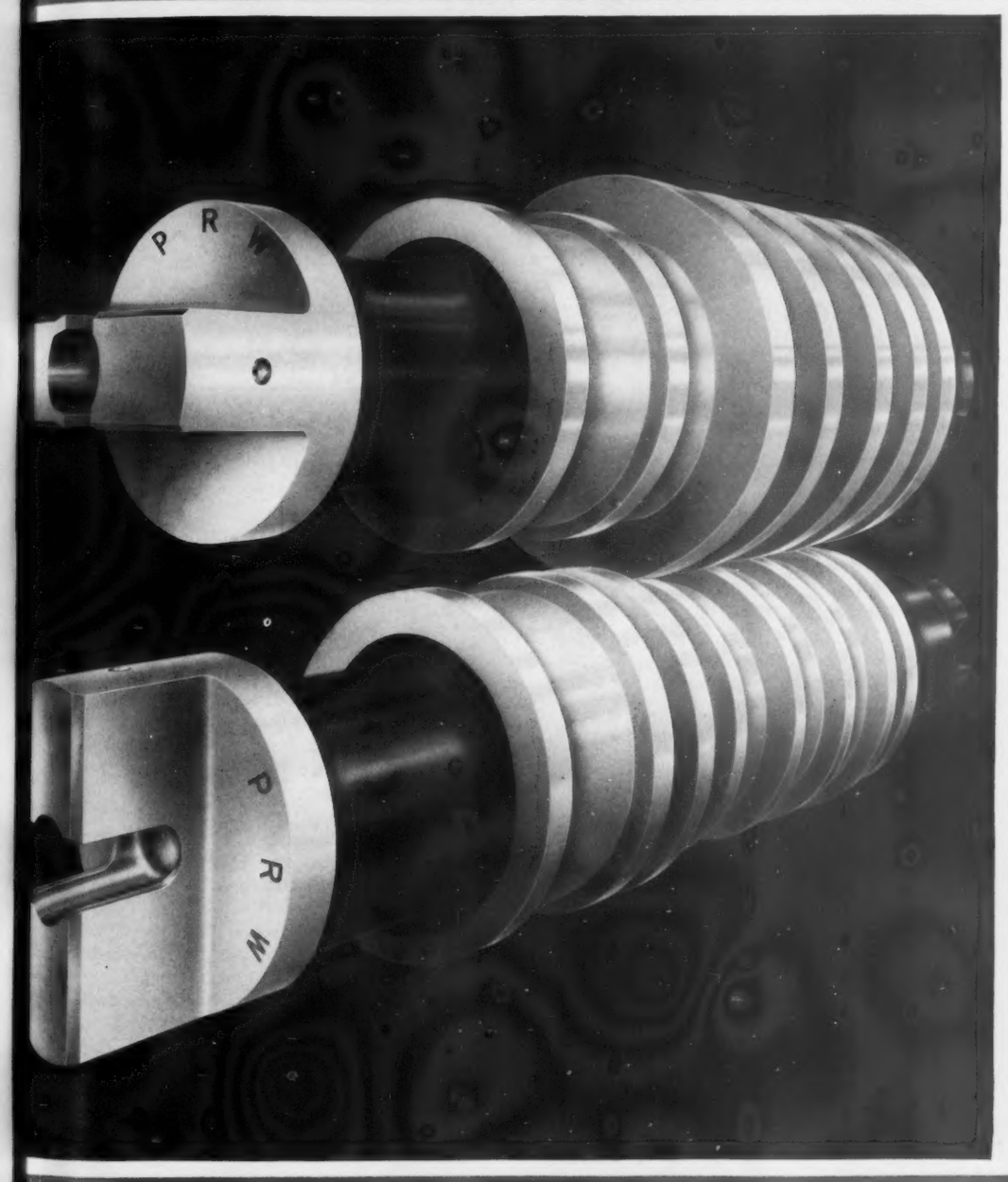


Fig. 3—Closeup of welding operation. Welding cycle repeats automatically as long as operator holds down foot pedal. Individual transformers for each tip, balancing autotransformers for voltage and current, and cableless head construction contribute to uniformity of welds

LESS COST per Ton of Steel Rolled



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Layout Innovations

Special handling devices facilitate heat treating. Work on drying table is heated by exhaust from the cleaning and rinsing tank heaters. Simple layout easily permits an output of 1200 pounds per hour

By GEORGE TINNERMAN
President & Gen. Manager
Speed Nut Division
Tinnerman Stove & Range Co.
Cleveland

■ WHEN Speed Nut division of Tinnerman Stove & Range Co., 2038 Fulton road, Cleveland, revamped and enlarged its quarters recently, an opportunity was provided to enlarge the heat-treating department and to install several innovations in equipment which have been found most satisfactory in operation.

The overall view of this department in Fig. 1 shows the two main hardening furnaces with various baths, drying table, drawing furnace, handling devices and other equipment. The work treated in this department consists entirely of Speed nuts which vary widely in size and shape, more than 300 different styles now being in use. However, the largest of these is only a few inches overall and the smallest is down to a fraction of an inch. They all must be heat treated to develop sufficient strength so the nut will not let go under the most severe vibration. This does not require delicate heat treating but can be done on a high-production basis as will be outlined below.

Fig. 2 is a closeup of one of the high-speed hardening furnaces before the other twin unit was installed. Each of the two high-speed hardening furnaces now used is gas fired with a pot 24 inches in diameter and 18 inches deep. Furnaces are lined with insulating refractory plus insulation, the entire unit being encased in a steel jacket and fired by four burners located at two different elevations. All burners fire tangentially so as not to impinge against the alloy top of the furnace.

Each furnace is equipped with a proportional mixer for one-valve control. Temperature of salt bath is controlled automatically by means of an automatic air valve located in the air line just ahead of the proportional mixer. An indicating-recording controller is connected to the automatic air valve to maintain the temperature of the salt bath at approximately 1500 degrees Fahr.

Due to number of burners used, heat is distributed uniformly. The burners are located at the top of the setting and the flue products are removed at the bottom. A slightly reducing atmosphere is maintained to prevent oxidation of the pot.

Speed nuts are loaded into the hardening furnace by means of a long handled, wire mesh bucket. After they remain in the high-speed furnace for about five minutes, the operator removes them by working a lever which lifts the container basket out of the salt bath and dumps its contents into another and larger basket of mesh resting in the adjoining quench tank.

Oil in the quenching unit is circulated continuously by an immersion-type agitator. This maintains uniform temperature and helps dissipate heat from the oil to the surrounding hollow walls in which water is flowing to take away excessive heat.

As seen in Fig. 1, there are two sections of monorail, each extending from the high-speed furnace to the drying table and passing over each line of rinse and quench tanks. This permits the mesh basket holding the charge of Speed nuts to be lifted

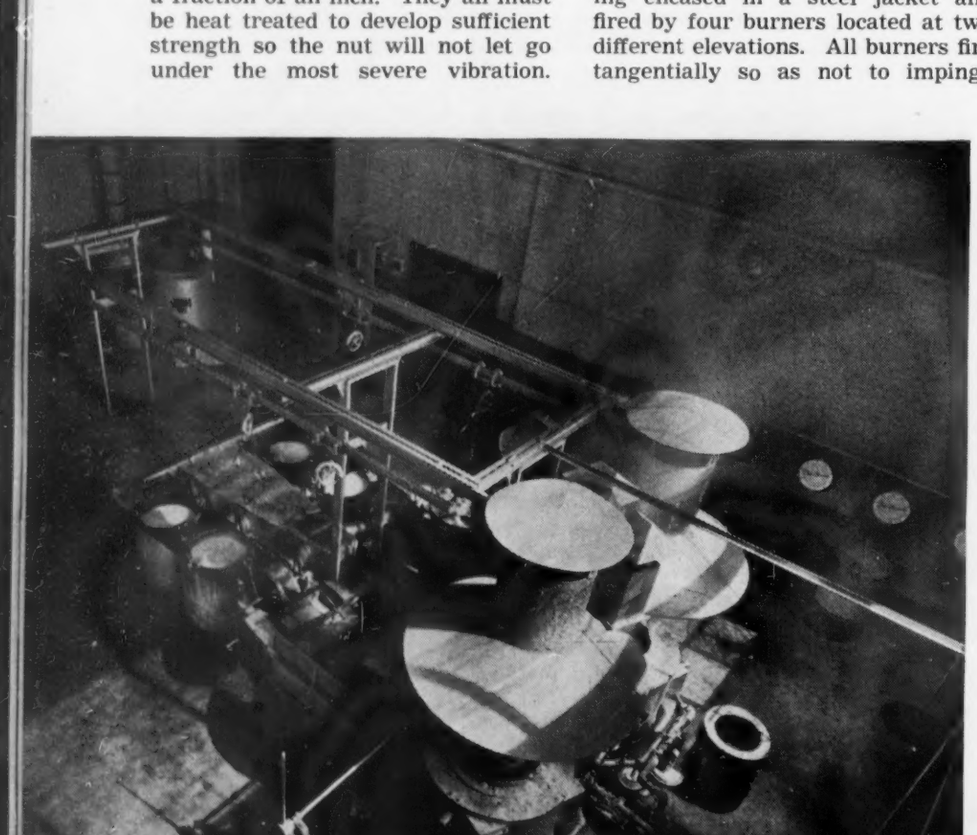

Fig. 1—Enlarged and revamped heat treating department. High speed salt pot furnaces near center, with two lines of quench, rinse and clean tanks going toward drying table at left. Overhead monorails serve both lines

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SAF-PILOT—Offers positive protection against explosion due to burner or pilot failure on gas-fired heaters, furnaces, ovens, boilers and similar equipment.

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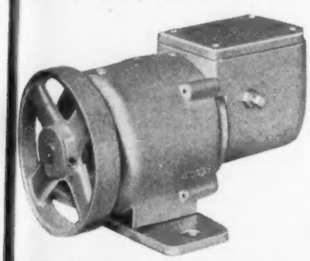

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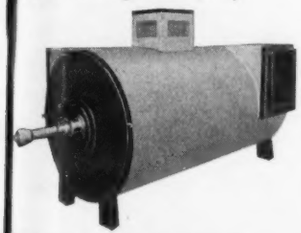

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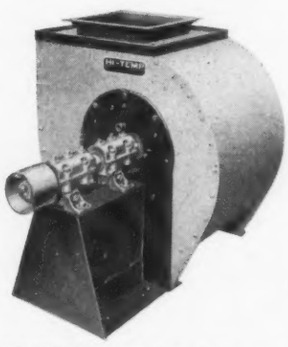

HI-TEMP FANS—Ideal for conveying convected heat at high temperatures. Offered in two heat ranges, 600° to 900° F. and 1050° to 1400° F. Water cooled bearings, well insulated, quiet and efficient in operation.

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from the oil quench bath and dumped into a rotating-type mesh basket seen in the first rinse tank just to the left of the quench tank in Fig. 1.

Here, it is revolved in the solution by means of a handle on the shaft of the container, thus permitting the Speed nuts to be rinsed most thoroughly and yet without undue exertion by the operator. This can be done quite rapidly, and the drum can be moved quickly from one tank to another by means of the monorail. After coming from the oil quench, the parts first are immersed in the hot water rinse, then in a tank containing a cleaning solution, followed by a soluble oil dip. From there they go onto the drying table at the extreme left of the line shown in Fig. 1.

The usual charge is about 30 pounds of Speed nuts. This amount can be handled down the line quite fast. With about five minutes for heating in high speed furnace, the two lines have a capacity of 1200 pounds hourly. The drying table at the extreme left has an open mesh top and is fed with the exhaust from the gas burners heating the various tanks and so dries the Speed nuts quite rapidly, preparing them for the drawing operation.

Speed nuts to be heat treated consist of spring steel with carbon content ranging from 0.75 to 0.85 per cent. After coming from the hardening line, this material checks between 60 and 65 Rockwell C. According to the type of service and type of nut, the material is given one of two drawing treatments. If drawn at 700 degrees Fahr., material has a hardness ranging from 49 to 51 Rockwell C. When drawn at about 775 degrees Fahr., the hardness is slightly lower, ranging from 47 to 50 Rockwell C. Fig. 3 shows a gas-fired unit heated by means of an air heater which is an integral part of the unit. Furnace can operate at any point between 350 and 1250 degrees Fahr., is equipped with protective equipment, spark plug ignition and all necessary control equipment to make for fully automatic operation. A nearby panel carries a recording indicating controller, and the ignition equipment.

Furnace Uses Gas

This furnace does not use air produced by a blower for combustion. It employs gas at atmospheric pressure. Temperature distribution throughout the work is extremely uniform because the 20-inch diameter 24-inch deep basket is heated by air forced through it from the top and out at the bottom. Then air is recirculated by means of an alloy fan which is an integral part of the furnace.

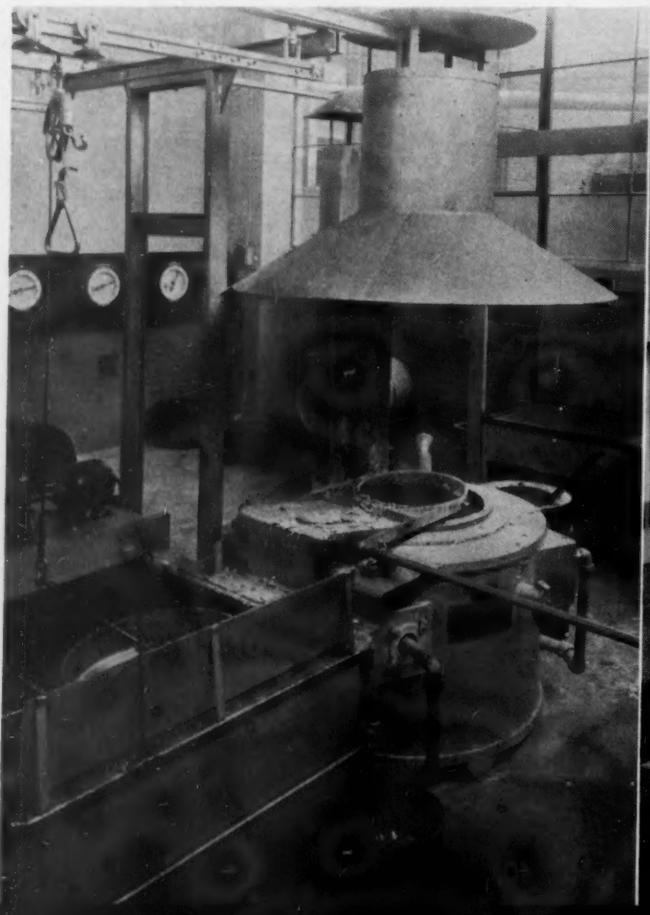
As can be seen in Fig. 3, an electric hoist and monorail are provided to load work from the drying tables into the drawing furnace. Also at the left is seen a tank containing an extremely thin oil into which the work is dipped to prevent rusting during storage and shipment.

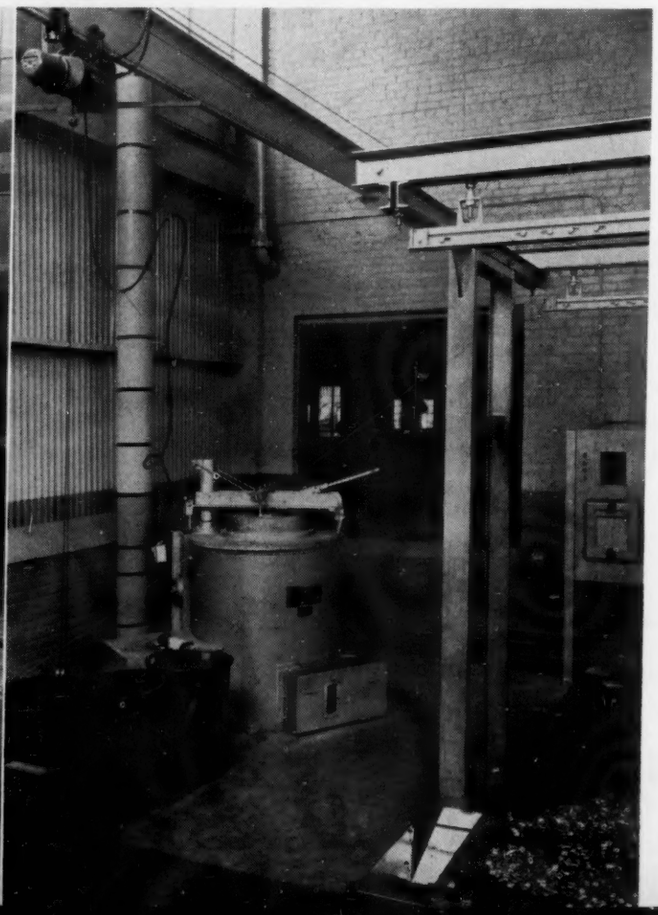
The air drawing furnace is able to accommodate the output of both of the hardening lines as material fed into it is considerably above room temperature due to the drying as well as heating action of the exhaust through the drying table.

High production is most essential for all operations in making Speed nuts. The provision for easy and quick transfer of material from one step to the next in the heat-treating cycle here is an outstanding factor in obtaining a high output. The efficient setup visible in Fig. 1 has been found to require a minimum amount of effort by the operator.

One of the most outstanding things seen by the visitor is the arrangement made to discharge the work from the high-speed hardening furnaces into the quench bath. To do this, the operator merely grips two handles on a projecting stand seen at the lower center in Fig. 1. Turning these counterclockwise lifts the work from the hardening furnace and dumps it into a container in the quench tank. This permits the operator to place another charge in the hardening furnace while the first charge is being rinsed, washed and placed on a drying table.

Fig. 2. (Left)—Closeup view of one of the high speed salt pot furnaces used in hardening line. Note mesh basket carried on hinged brackets which permit quick dumping into quench tank at left. Fig. 3. (Right)—The air draw furnace is in the far corner with overhead monorail and hoist for handling loads in and out. Drying table at right foreground has open mesh top through which exhaust gases from rinse and clean tank heaters pass





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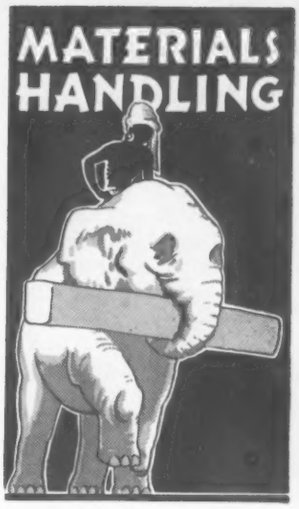


Grinding Wheels

This product cannot be handled roughly since chipped edges are causes for rejects. A conveyor system equipped with wood pallets prevents such losses and at the same time facilitates production, lowers costs

■ AT THE PLANT of Norton Co., Worcester, Mass., much time and effort has been expended in formulating more efficient intra and interdepartmental movement of grinding wheels.

A decade of experience with conveyor systems has proved its worth in the ever present battle to lower handling costs. From a beginning in which the conveyor system was used merely to eliminate hand trucking in the packing and shipping departments, the system has been expanded until today about 4½ miles of conveyors swiftly and economically move approximately 95 per cent of all grinding wheels once they have entered the truing department. Extreme care was exercised from the start to determine the most suitable conveyor equipment and to assure proper flow and sequence of operations.

Grinding wheels cannot, of course, be handled too roughly without causing chipping and consequent rejection. This problem necessitated much thought as to how best to handle them on a conveyor system and finally resulted in the development of a wooden pallet 30 x 20 inches capable of carrying a maximum load of 400 pounds.

The conveyor equipment in its present form begins at the unloading platform of the vitrifying kilns. Upon removal from continuous tunnel kilns, wheels 16 inches or less in diameter are loaded onto a conveyor which speedily and safely moves them to the truing department. In this department the wheels are distributed to various machines where they are sided, faced and reamed or bushed. When they are completed, the operator slides them onto a conveyor shown in Fig. 1, which is waiting to take the wheels on their journey to the grading and stamping departments.

Here the pallets are switched to any one of a series of roller conveyors which run at right angles to a main line, making it possible to sort the wheels by size for more efficient handling in grading and stamping. Those wheels which are to be placed in unfinished stock are moved from the grading department on the main line conveyor, Fig. 2, to a swinging tray type elevator, Fig. 3, which raises them three floors to the stock department. At this point gravity rollers remove the pallets from the elevator.

The trays on this type elevator are are held by two endless chains which operate over sprockets. By the turning of a dial it is possible to have pallets either received or deposited at whichever floor may be desired.

Those wheels which are not placed into unfinished stock bypass this elevator and move on to the balancing and testing departments. Here

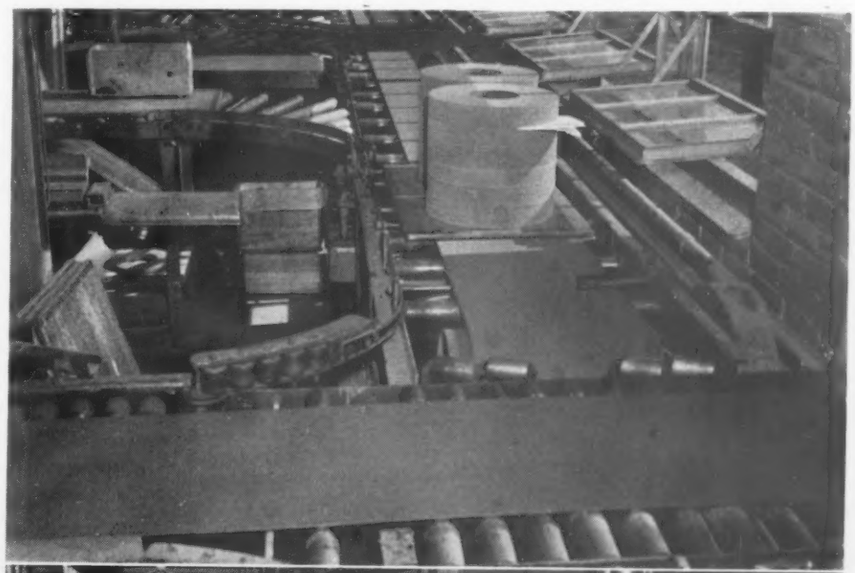


Fig. 1. (Upper)—Wood pallets on belt conveyor carry grinding wheels from truing to grading and stamping departments

Fig. 2. (Lower)—Wheels for unfinished stock go to elevator on this main line conveyor

a conveyor setup similar to that in the grading department is employed to separate the wheels prior to balancing and speed-testing. When this process is completed, the pallets are shunted once again to the main line and are carried down one flight and through a tunnel beneath railroad tracks into the inspection department.

Once again a series of conveyors at right angles to the main line serves to separate the wheels as to size to facilitate the inspection process. This process finished, the pallets are again returned to the main line. This carries them to a reciprocating type elevator, Fig. 4, which automatically raises them to the packing department on the floor above. This elevator remains inactive until a pallet slides into the loading station whereupon it automatically descends, picks up the pallet and unloads it on the floor above, continuing to operate as long as there are pallets to be delivered to the packing department.

As was the case with the swinging tray type, the reciprocating elevator is equipped with limit switches to prevent overlapping of pallets and consequent jamming. Thus an orderly movement into the loading station results.

In the packing department, the wheels are either shunted to another conveyor which relays them to finished stock, or are packed, ready for shipment. Above description covers the system by which wheels are conveyed from the kiln department to their several destinations, some going to finished or unfinished stock and some to the loading platform.

A parallel system, working in the opposite direction, permits empty pallets or rejected wheels to be returned to the truing department. Nor is the use of the conveyor limited to the production process; a very efficient overhead chain conveyor is used to move cans of abrasive, weighing upwards of 400 pounds, from the grain sizing department to the grain storage building.

Another labor and time-saving installation which has more than proven its worth is the network of pneumatic tubes which link the various departments, with a consequent saving of thousands of dollars annually.

Those unacquainted with the manufacture of grinding wheels often do not readily appreciate the considerable amount of time consumed by actual production processes, but few people interested in any type of manufacturing fail to realize the necessity of reducing handling time to a minimum, or the resultant benefits to customer service. This end has been admirably accomplished by the conveyorized installations which, in addition, have cut trucking costs and relieved the employes of much tedious and unnecessary lifting.

Fig. 3. (Upper)—Swinging tray type elevator lifts wheels to unfinished stock room three floors up. When selector dial control is set elevator loads and unloads automatically at any floors without further attention. Fig. 4. (Lower) Reciprocating type elevator automatically raises wheels to packing floor above. This elevator and that in Fig. 3 are equipped with limit switches to prevent overlapping and jamming of pallets

Laboratory Manual For Aluminum Analysis

■ Second edition of "Standard Methods for the Sampling and Analyzing of Aluminum and Certain Aluminum Alloys," a laboratory manual for use by analytical chemists, has been published by Aluminum Research institute, 308 West Washington street, Chicago. The manual has 31 loose-leaf pages and covers determination of chromium, copper, copper plus lead, iron, lead magnesium and calcium, manganese, nickel, silicon, tin, titanium and zinc. Of the 13 methods in the first edition, five remain unchanged and four new methods have been added.

Complimentary copies are available to domestic consumers of aluminum alloys who maintain their own laboratory, to commercial laboratories and technical schools. A charge of $1 a copy is made to others.

Wire Rope Guys

(*Concluded from Page* 55)

nite achievements and constitute an advance in the art of making wire rope for guy purposes.

Another problem that has been solved satisfactorily and efficiently is the proper tensioning of guys for radio towers, etc. Until this method was devised it was difficult and expensive to accomplish this. Now, by using the procedure described in U. S. Patent No. 2,071,694, it is possible to tension equally all of any number of guys simultaneously.

This method consists briefly of attaching, preferably near the lower end of any guy, a pair of metallic buttons cast about 100 inches apart around the guy and calibrated at the factory while the rope is under the tension to be used in erection. This is done during the prestressing operation. Calibrated measuring rods are used which can be applied simultaneously to these buttons. When adjustment of guy ropes shows all guys to be of exactly equal length on the 100-inch distance usually employed for the metallic buttons, all guys are taking proper load.

Steel tray assembly enables Exide-Ironclads to handle more tonnage per turn

EXIDE-IRONCLAD BATTERIES for electric industrial trucks are now available assembled in steel trays in addition to the wood trays universally used up to now. This new use for steel makes room for extra battery power in the battery compartment of your truck—providing higher speeds, livelier trucks, greater power, and more tonnage handled per turn.

Exide
IRONCLAD
BATTERIES
With Exide **MIPOR** Separators
"MIPOR," Reg. U. S. Pat. Off.

In a typical instance, a 39″ x 27″ compartment takes a wood tray battery of 15 cells, 19 plates, and 13 k.w. hr. capacity. With Exide-Ironclads in the new steel trays, the same compartment will now hold an oversize 18-cell, 21-plate battery of 17.4 k.w. hr. capacity —34% more power and 20% higher voltage. Or the saving in space will permit shortening the wheelbase of trucks so that they can make sharper turns in aisles.

In addition, when oversize Exide-Ironclads are installed, less counter-weight need be carried. Inert pig lead is replaced by useful *extra* battery power for handling more tonnage, faster.

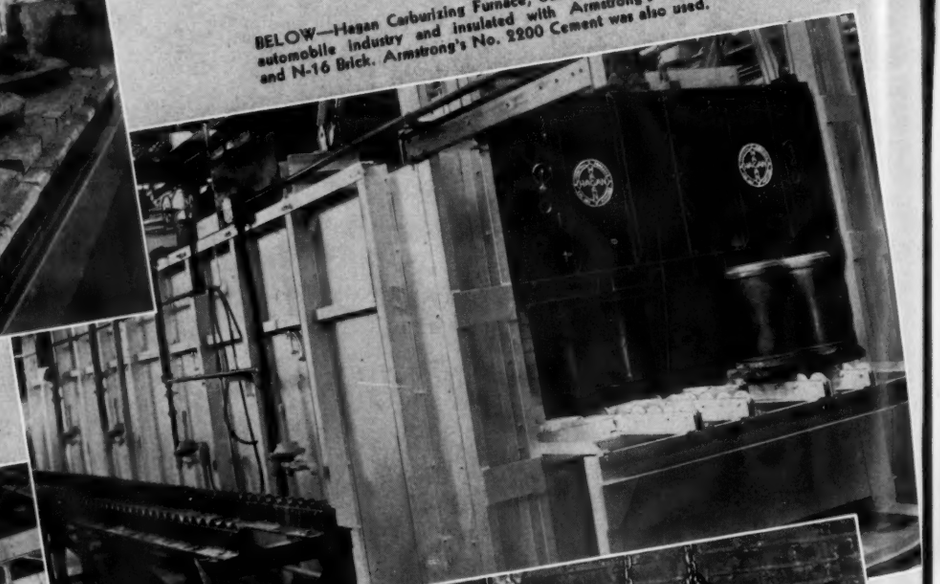
Let us analyze your trucking requirements and submit a report on what Exide-Ironclads in the new steel trays can accomplish in your plant. There is no obligation—write us today.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

Where heat is
ARMSTRONG'S BRICK

ABOVE—Oil-Fired, Car Hearth Bright Annealing Furnace, built for the Rotary Electric Company by Philadelphia Drying Machinery Company. Insulated with Armstrong's EF-22 Brick.

BELOW—Hagan Carburizing Furnace, built especially for the automobile industry and insulated with Armstrong's EF-22 and N-16 Brick. Armstrong's No. 2200 Cement was also used.

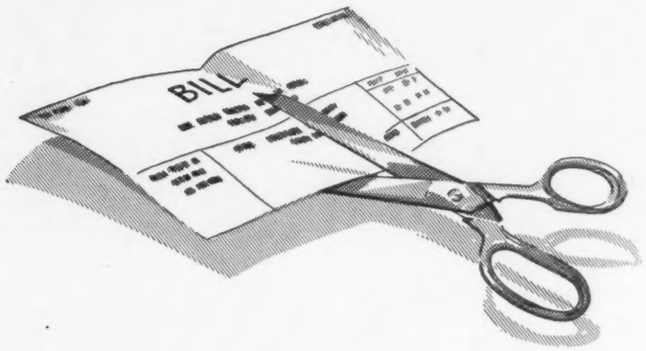


ABOVE—Electric Furnace continuous atmosphere furnace for bright annealing cold rolled steel in strip form. Insulated with Armstrong's Brick.

ABOVE—Lindberg Cyclone Furnace used for production tempering. Fast heating and accurate temperature control are helped by Armstrong's Insulation.

LEFT—This Lee Wilson Bell Type Furnace and four bases are used for low carbon wire annealing. Armstrong's Brick assure better heat control.

...used in industry
...HELP TO CUT COSTS



MEN who work with furnaces know the value of insulation. They know that Armstrong's Insulating Fire Brick can lower fuel costs, increase operating efficiency, and give more accurate temperature control. This means that combined with economy these brick offer aid in processing accuracy with a decrease in manufacturing problems and with product improvement.

Leading furnace builders find, too, that Armstrong's Brick offer construction advantages, because of their light weight, as well as their accurate sizing and high crushing strength. Their low heat capacity helps to bring furnaces to required temperatures faster—an important advantage for intermittent furnaces.

This modern insulation is available in standard sizes, and in special shapes and sizes to meet special needs. Investigate also, Armstrong's new Ingot Insulation recently developed for steel mill use.

Let us send you full information about Armstrong's High Temperature Insulation. Write today for samples and prices to Armstrong Cork Company, Building Materials Division, 985 Concord Street, Lancaster, Pennsylvania.

[See the Armstrong Exhibit at the National Metal Exposition, Chicago—Booth K322]

Armstrong's
HIGH TEMPERATURE INSULATION

OPRTEX BLOCK
INSULATING FIRE BRICK
REFRACTORY CEMENTS
DIATOMACEOUS EARTHS

New Plants, Replacement Equipment Are Seen as Increasing Use of Gas

■ BELIEF that business will continue at a relatively high level for some time to come represented sentiment expressed at the twenty-first annual convention of the American Gas association in New York, Oct. 9-12. An attendance of 1500 represented utilities, equipment manufacturers and consumers of gas.

Speaking at a luncheon inaugurating activities of the industrial gas section, Charles G. Young, manager, Springfield Gas Light Co., Springfield, Mass., declared a considerable increase in new plant construction may be expected but warned that it would not be wise to forget the replacement market, especially from industries associated with production of war materials. These industries have lagged in bringing their facilities up to date, he said.

During the past few years industrial gas rates have been lowered to compete more effectively with low-cost fuels, but Mr. Young ventured the opinion that higher costs might force some readjustments although these probably would not be large.

Retiring President Conrad N. Lauer, president, Philadelphia Gas Works Co., Philadelphia, urged the gas industry to continue its program of expansion, but warned war abroad would tend to retard peacetime pursuit progress.

Uniformity With Gas Fuel

Clayton S. Kronkright, Public Service Electric & Gas Co., Newark, N. J., and chairman, ferrous metals committee, declared the gas industry today holds an enviable position in the metalworking field through development of equipment by which it is possible to control both temperature and atmosphere. Thus, the metalworking industries can turn out products of uniform character with a minimum of rejects.

He said further that the country stands on the threshold of increased business activity for some time to come and that it is the job of the gas industry to take advantage of this period. He pointed out that the industrial section's advertising campaign is telling industrial consumers what gas fuel is and what it can do.

Frederic O. Hess, president, Selas Co., Philadelphia, discussing building the industrial load by improved applications, referred to the newly developed industrial finishes which provide higher luster, greater toughness, improved weather resistance and shorter baking cycles. Formerly, a metal product, such as a bicycle, required a baking cycle of 30 to 45 minutes; now a finish can be baked on in 2 minutes.

Therefore, to handle such short cycles, which are desirable in numerous instances for speed of production, continuous production and reduction of work in process, entirely different principles of drying or curing, circulation, and temperature control must be applied. Refinement in equipment is definitely necessary, he said, to meet demands of these new finishes and to compete with highly publicized competitive baking methods.

Furnace Muffles Eliminated

Discussing refinement of gas application further, Mr. Hess said it has been found that stainless steel strip can be clean-annealed in a continuous process, without use of muffles, in a direct-fired combustion chamber, provided the atmosphere within the combustion chamber is kept within very definite limits. Such an installation results in considerable fuel economy and eliminates the necessity of replacing muffles at six-month intervals at a cost of $1800 each. Similar experience has been encountered in the copper industry, he said.

Outlining methods for selling standard rated industrial gas furnaces, C. B. Phillips, vice president, Surface Combustion Corp., Toledo, O., declared that the first and most essential step in any sales program is a general survey of the problem to determine what is to be accomplished. Then, a set of specifications should be prepared covering the entire proposed operation. Other steps include a thorough analysis to determine disadvantages of the present method, a decision upon what furnace equipment will meet requirements and careful compilation of cost statistics. Visits by the prospect to other plants to inspect industrial gas installations are most convincing, he said.

If there is to be a real recovery in the gas industry, appliances must be brought down to a price level where consumers can purchase them, according to E. F. Jeffe, vice president, Consolidated Edison Co., New York. It must be made possible, he said for even low-income consumers to purchase appliances on satisfactory financing terms.

Summer air-conditioning holds great opportunities for the gas industry, said Allan W. Lundstrum, Ebasco Services Inc., Electric Bond & Share Service Corp. Increase in annual sales by 55 per cent might follow this development in air-conditioning.

Only through production of valuable by-products is it possible to materially reduce gas production costs in the opinion of Louis J. Willien, chief engineer, Public Utility Engineering & Corp., service unit for the Standard Gas & Electric Co. system. Thermal efficiency of present methods used in the production of coal gas and carbureted water gas is so high there is little chance of reducing materially gas production costs, he declared.

Urging the industry to take advantage of new residential construction, F. M. Banks, vice president, Southern California Gas Co. favored the development of style consciousness, both as to appliances and service. More than 90 per cent of new homes are equipped with gas ranges or water heaters and 91 per cent with gas space heating.

Frank C. Smith, president and general manager, Houston Natural Gas Co., Houston, Tex., urged the formation of a research institute for the natural and manufactured gas industry.

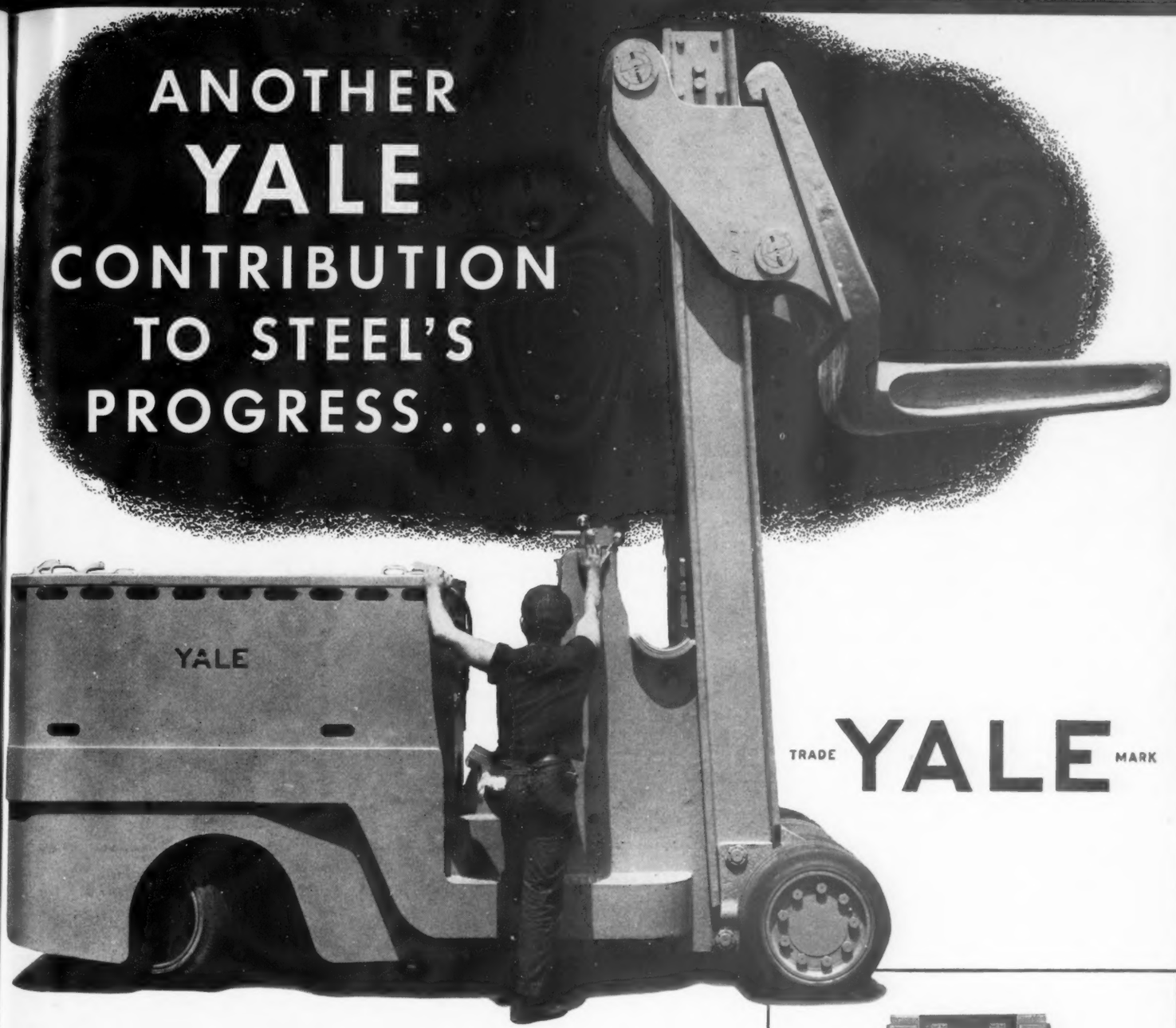
Metals Society Expands Its Employment Service

■ For benefit of its members, American Society for Metals has established a new type nation-wide employment service with offices in most of the principal cities. This plan, effective Oct. 16, augments the society's previous employment service, handled only in the Cleveland headquarters, to a coverage providing service through 33 select, well-established employment offices from coast to coast. At the same time, every application and most job openings will be on record in the Cleveland office of the chain.

The organization chosen to set up this new service is the Employment Counsellors Association of the United States. The Cleveland member of that association, which becomes the national American Society for Metals employment headquarters, is the Technical Placement Service, 504 Swetland building, managed by T. G. Protheroe and A. R. Bradley.

In the few cities where society chapters are located but as yet no local employment office is affiliated with the chain, chapter secretaries will be provided with forms and applications and details of the service.

ANOTHER YALE CONTRIBUTION TO STEEL'S PROGRESS . . .



TRADE YALE MARK

. . . THIS 25,000 LB. CAPACITY GIANT

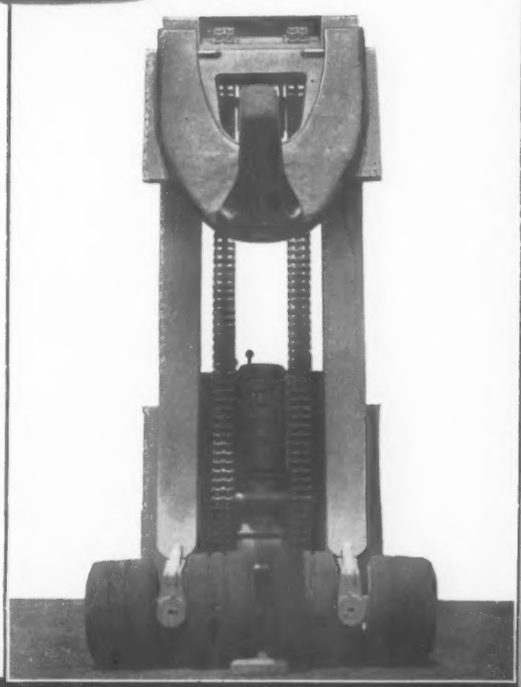
Materials handling in the steel industry has gone through a major evolution in the last five years—Particularly in the new continuous mills. A few years ago 6,000 lb. coils were standard. Today, 25,000 lb. coils have to be coped with.

Progress on this scale has called for corresponding progress from equipment manufacturers. Yale's latest contribution is a fleet of giant 25,000 lb. cap. Ram Trucks recently delivered to one of the country's leading mills. Built to handle huge coils—these trucks feature many mechanical advances, some of which follow.

Time Delay Control in conjunction with exclusive Yale Cam-O-Tactor controls speed in correct intervals one step at a time. This cushions driving mechanism—decreases strain . . . increases truck life.

Hypoid Spur Geared Drive—No steering knuckles . . . fifth wheel rotating construction—Flame hardened gear teeth—Controlled articulating load wheels—Unit welded steel frame with 1½ inch thick steel side members—56 inches of load rubber—Yale Electric Steer (follow through type)—Lifting chains with ultimate strength of 210,000 lbs. . . . All are included on these trucks.

For as Steel progresses . . . so progresses Yale.



THE YALE & TOWNE MANUFACTURING COMPANY

PHILADELPHIA DIVISION • PHILADELPHIA, PA., U. S. A.

MANUFACTURERS OF ELECTRIC INDUSTRIAL TRUCKS • ELECTRIC HOISTS • CHAIN BLOCKS AND HAND LIFT TRUCKS IN ALL CAPACITIES

Mirrors of Motordom

(*Concluded from Page 42*)

featured by engines of new Dodge truck models, high compression cylinder heads being used on all. Six different engines, including a diesel, are used on the line. A new alloy in the Amola series is being used in the axle shaft, springs and other vital parts. All rear axles are of the hypoid type.

Willys has introduced a new ½-ton all-purpose pickup truck of all-steel construction and priced at $525, Toledo, O.

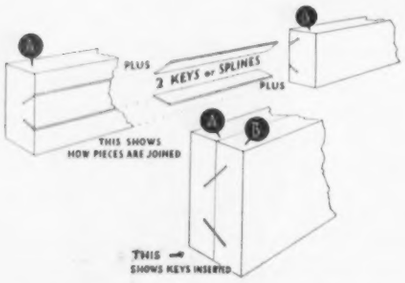
Ford has increased factory-delivered prices on all models by $20 to $30, but consumer-delivered prices will be lower in some sections of the country due to changes in freight and handling charges.

Trucks in the Ford line for 1940 will have longitudinal springs, front and rear, with Hotchkiss drive. Forty changes have been made in the interests of accessibility for servicing, economy and simplicity.

New Spline Lock

■ A new and simple method of joining two pieces of a material by means of steel splines is used in the Homer spline lock, marketed by Doughty Marketing Corp., 342 Madison avenue, New York. The method, granted patent 2,107,691, supplants the use of tongues and grooves, dowels, dovetails, rabbetting and lapping.

The steel splines, or keys, are inserted in matched grooves in two pieces of the material to be joined, such as A and B in the accompanying illustration, anl bonds the pieces face-to-face. According to kind of wood used, this method is claimed to be three to ten times stronger than the ordinary joint.



Splines inserted into matched grooves in two pieces of material to join the pieces is the basic principle of the Homer spline lock

By decreasing the width of the grooves or by increasing the thickness of the splines, tension and friction between the pieces increase in the same ratio to the point where the two pieces become immovable longitudinally in relation to each other.

When applied to block hardwood floors, this method is said to make possible permanent edge-to-edge relationship of the blocks, cut cost of laying and automatically level the floor. Such blocks are double-grooved on four sides to take splines instead of tongue and grooves and blind nailing.

Inert Lining Cement

■ A new impervious synthetic resin cement, "Korez," developed by Atlas Mineral Products Co., Mertztown, Pa., is applied as a mortar and quickly sets by chemical action at room temperature to a dense, strong, nonporous jointing material.

The cement is claimed to be inert to all acids, except the highly oxidizing ones. It also is inert to oils, water and mild alkalies at temperatures up to 330 degrees Fahr. and is not affected by abrasion or turbulent liquids.

Used as an acid-tight jointing material for acidproof brick, the cement has successfully solved corrosion and maintenance problems in construction of acid pickling tanks, acid neutralization and disposal equipment in the steel and allied industries. Being nonporous, the lining is particularly adapted to the construction of equipment for the recrystallization of salt solutions.

Foundries Must Educate Customers On Design Features of Castings

■ SINCE designers of castings usually are not thoroughly familiar with foundry phases of castings production, it is important that foundrymen and designers maintain close co-operation to the end that the latter may profit from what the former have learned by bitter experience. This was emphasized at the third annual Southwest regional conference of the St. Louis chapter, American Foundrymen's association, in St. Louis, Oct. 5-7. Nearly 500 Southwestern foundrymen attended the gathering.

Discussing the subject from the viewpoint of steel castings, C. E. Akers, Locomotive Finished Materials Co., Atchison, Kans., pointed out it must be kept in mind that cooling rates vary widely and that gradual change of section thickness will save grief in the foundry. Slight changes in casting design can eliminate many production difficulties. For example, rounding off corners on two sections which join to form a right angle will afford uniform cooling, likewise, use of substantial fillets on interior angles is a benefit. Another change paying dividends is the staggering of arms or sections which ordinarily join at one point to form a cross or X-section.

Mr. Akers asserted that heat transmission of molding sand is comparatively low, therefore, casting design should be such that nothing interferes with this transmission.

Approaching the design subject from the viewpoint of gray iron, E. B. Carpenter, American Car & Foundry Co., St. Louis, stated that cost of a casting is related directly to complexity of the casting and problems of production. The designer, having only meager knowledge of foundry practice, gets into difficulty, because he first considers a job as a series of elements and later joins them to form a single unit.

Books in general give an erroneous impression of cast iron, implying that it is inexpensive, economical, easy to produce, and lends itself not only to rapid production, but also to intricate work. Hence, Mr. Carpenter said, the foundry is obliged to enlighten customers and impress upon them importance of design. It is advantageous to suggest design changes and to show the difference in cost between the submitted design and improved design. Foundries must insist on substantial patterns and should check weights of castings as indicated on drawings.

Mr. Carpenter cited design changes which proved profitable to both foundry and customer. In one case, an assembly made in two pieces bolted together gave high breakage; when the job was redesigned as a one-piece casting, breakage was eliminated and cost reduced 50 per cent. In another case, a large chemical kettle with a boss adjacent to a flange was altered so that the boss was cored—this equalized metal thickness and eliminated shrinkage at that point.

C. R. Culling, Carondelet Foundry Co., St. Louis, emphasized that gray irons constitute a family rather than a single material, consequently design must be considered in relation to the particular type of iron to be employed. Foundrymen will complain about patterns supplied

We help ourselves and we help others when we repeat over and over

NITRALLOY

is the hardest known steel surface for wear resistance!

HERE ARE A FEW TYPICAL APPLICATIONS . . .

Calender Rolls
Cams and Camshafts
Chain Links and Pins
Connecting Rods
Crankshafts
Cylinder Liners
Die Casting Dies and Cores
Diesel Engine Fuel Injector Pump Parts
Fan Blades
Gears
King Pins
Knuckle Pins
Mandrels and Rings
Pinions
Piston Rings
Piston Rods and Rings
Pump Rotors and Sleeves
Push Rods
Scale Balances
Scale Blocks
Seal Rings (Refrigerator)
Seaming Rolls
Seats for Valves
Shackle Bolts
Shafts
Sockets
Spindles
Splines
Sprockets
Steering Worms
Tappets
Valve Gauges
Valve Seat Rings
Valve Stems and Sleeves
Water Pump Shafts
Wear Plates
Worms
Wrenches
Wrist Pins

HERE ARE COMPANIES LICENSED BY THE NITRALLOY CORPORATION . . .

NITRALLOY STEEL

ALLEGHENY LUDLUM STEEL CORP.
Watervliet, N. Y.

BETHLEHEM STEEL CO.
Bethlehem, Pa.

CRUCIBLE STEEL CO. OF AMERICA
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FIRTH-STERLING STEEL CO.
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THE TIMKEN ROLLER BEARING CO.
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THE LAKESIDE STEEL IMPROVEMENT CO.
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LINK-BELT CO.
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METALLURGICAL LABORATORIES CO.
Philadelphia, Pa.

NEW ENGLAND METALLURGICAL CORP.
South Boston, Mass.

PITTSBURGH COMMERCIAL HEAT TREATING CO.
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THE QUEEN CITY STEEL TREATING CO.
Cincinnati, Ohio

WESLEY STEEL TREATING CO.
Milwaukee, Wis.

CANADA

ONTARIO RESEARCH FOUNDATION
Toronto, Ont.

AND HERE ARE A FEW THINGS TO REMEMBER . . .

NITRALLOY, when treated by the nitriding process, produces the hardest known steel surface; files cannot mark it; it scratches glass readily. The resistance of nitrided surfaces to abrasive wear has been proved to be markedly superior to the best carbon or case hardened steels extant. NITRALLOY, in addition to its extreme hardness and long wearing qualities, retains its dimensions; distortion is kept to a minimum. New uses are being found for NITRALLOY constantly; maybe it will help you. Inquiries cost nothing. Write to

★ ★ ★ ★ ★ ★

THE NITRALLOY CORPORATION, 230 Park Ave., N. Y.

"all I had to do was

A factual field report from Henry Fox*

FIELD REPORT

Found out why these people were so anxious to know how our potentiometer pyrometers would stand up under shock and vibration. They've got the three controllers and a multiple point recorder mounted on a dolly that gets pushed all over the shop--which is anything but a dance floor, believe me!

The instruments are controlling "Falcon" wrap-around coils for pre-heating and stress-relieving welds. Most of the work is heavy stuff, so it's a lot more convenient to bring the instruments to the job than the other way around. Just the same, they're mighty fussy about the accuracy of control.

Everything is hunky-dory, though, thanks to our unique suspensions and rubber mounting. Despite the pushing around, they've been holding temperature on the button right along. By this time, these people were ready to tell me how well Foxboro's stand up. All I had to do was listen. So-o-o, it looks like Foxboro is going to have the edge from now on whenever they need Pyrometers.

Henry Fox

*"Henry Fox," the typical Foxboro Field Man, is only incidentally a highly trained instrument engineer ... first of all, he's an *application specialist* who knows the measurement and control problems of operating processes from practical field experience. From his thorough understanding of the processes, he can tell what, why, when and where instruments should be applied for true economic balance. What's more, he has learned to cope with the mechanical details that crop up when instruments are put to work in going plants.

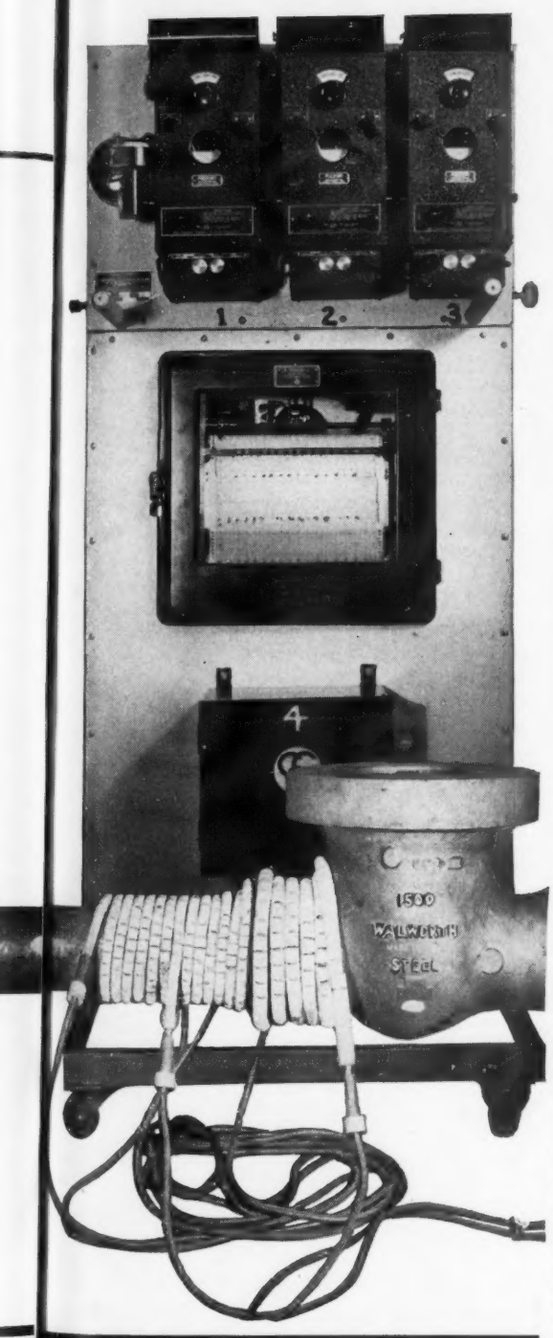
Remember, "Henry Fox" is at your service whenever temperature, pressure, flow, liquid level, or humidity are factors affecting your own costs or profits.

THE FOXBORO COMPANY
118 Neponset Avenue
Foxboro, Mass., U. S. A.
Branches in 25 Principal Cities

FOXBORO
REG. U. S. PAT. OFF.
Instruments

CONTROL THE PROCESS AND YOU CONTROL

listen"



THE PRODUCT

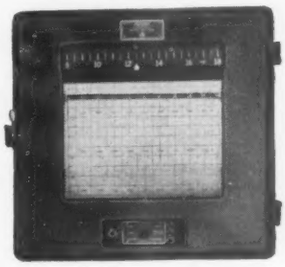
FOXBORO METAL SHOW RECORD

Booth K-305 Will Be Instrument Headquarters

For up-to-the-minute information on problems of pyrometry, temperature control and other fields of instrument service, stop in at Booth K-305 at the National Metal Show. The following Foxboro men will be on hand to discuss recent instrument progress that makes new savings possible in your plant: J. J. Burnett, M. A. Schreiner, J. C. Fryer, O. R. Prescott, S. C. Horn, C. E. Hellenberg, E. R. Huckman, A. B. Bates, H. L. Lee.

New Recorder-Controller Assures Unified Accuracy

In the new Foxboro Indicating Recording Controlling Pyrometer, the slide-wire contact, recording pen and control actuating mechanism all operate as a single integral unit. The slightest change in measurement *must* produce a corresponding movement of the record and control



system. The unique "roller motion" balancing mechanism gives fast movement of the recording device without fast driving of the mechanism.

You'll be surprised to see how simple this triple-task instrument really is. Gadget-free, it still outperforms the field. Don't miss learning more about it. *(Foxboro Bulletin 765)*

Recording Pyrometer Has Improved Features

Foxboro's new potentiometer recording pyrometer already has now proved its precision and trouble-free operating characteristics in rigorous service at leading plants. At the Foxboro booth, you can see the features that account for its performance record: Integral mounting of slide-wire contact and recording device eliminates all possibility of "transmission error" due to gear backlash or pulley slippage. The slightest pointer movement is detected and the temperature change recorded on the wide-spaced, 12-inch, legible chart. A self-compensating slide wire system keeps galvanometer sensitivity constant all across the scale. The entire unit has been engineered to be *sensitive* without being *delicate. (Foxboro Bulletin 190-3)*

Portable Indicating Pyrometer Offers New Convenience

For temperature exploration, for checking service instruments, for laboratory and pilot-plant work, and as an emergency replacement unit . . . the new Foxboro Portable Indicating Potentiometer Pyrometer gives great convenience with complete assurance as to results. The scale is 17 in. long, with an easily read vernier dial.

Ruggedly built and enclosed in a dust-tight welded aluminum case, the unit may be operated horizontally or vertically with equal accuracy. Look it over at the Show. *(Foxboro Bulletin 763)*

Complete Line of Foxboro Potentiometer Controllers

Today, with automatic temperature control being applied to more and more specialized applications, you'll need the unbiased advice of an organization offering a complete line of these instruments. Foxboro offers both throttling and open-

and-shut types. Controllers designed for electrical operation are made with both mercury switch and intermittent, brush-type contacts. Other models utilize air-operated valves. As companion units to its potentiometer controllers, Foxboro also offers automatic controllers of the electric resistance thermometer type. Foxboro representatives at the Show will be glad to discuss with you the type best fitted to your needs. *(Foxboro Bulletin 202-3)*

to them, but are backward in suggesting design changes and reasons therefor, said G. P. Phillips, International Harvester Co., Chicago. His opinion was that customers usually will co-operate when they find why changes are desirable. R. E. Kennedy, secretary, American Foundrymen's association, Chicago, suggested that one reason welded construction has progressed so rapidly is that each job is designed for that type of fabrication; foundries should follow the same procedure.

Synthetic molding sands are coming into wider use, declared N. J. Dunbeck, Eastern Clay Products Co., Eifort, O. They cost from 60 to 70 cents a ton and, although requiring more mixing equipment and control, they dry out more rapidly than natural sands, and frequently give better finish on castings because finer grain sizes can be employed without too much decrease in permeability. Advantages of synthetic sands, he stated, are low cost, low moisture content, high permeability and flowability. Three general types of bonding sands are used.

Photo-Cell On Scale Beam Controls Weight of Metal In Pouring

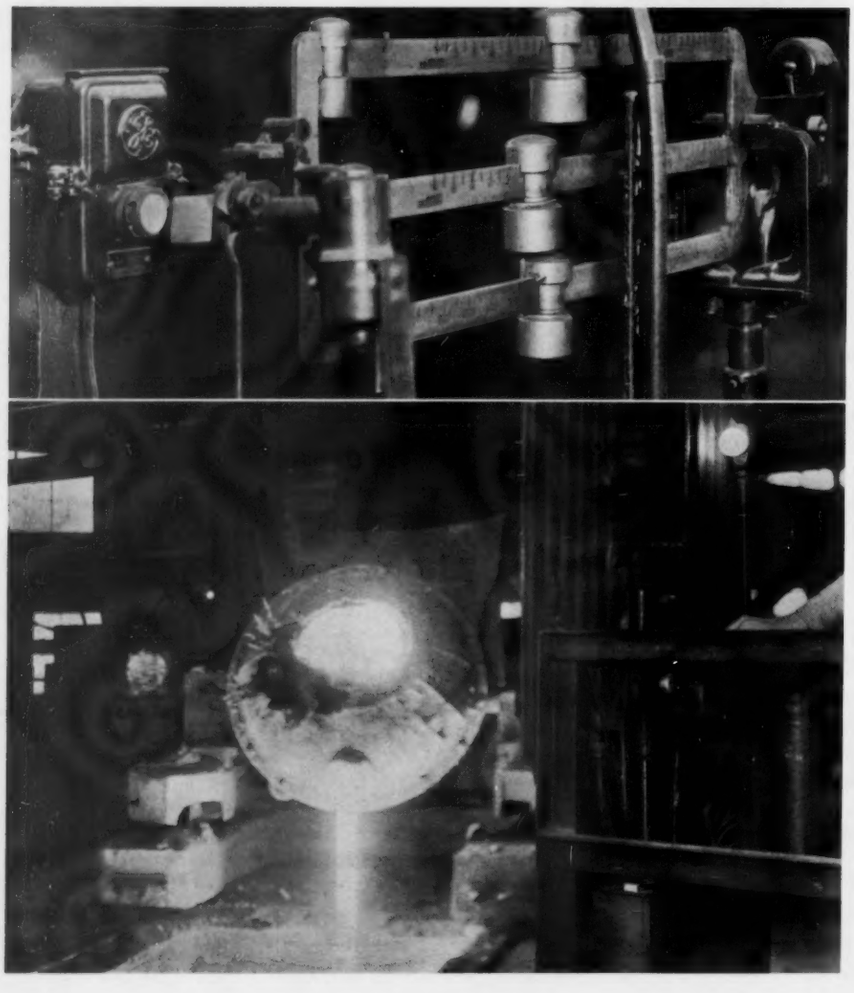
■ In the Economy, Pa., plant of A. M. Byers Co., Pittsburgh, wrought iron is produced by pouring highly refined molten iron into a specially prepared processing slag which is essentially an iron silicate.

In order to make the highest quality wrought iron, it is necessary to control the rate and amount of molten metal introduced into the processing slag in producing the individual sponge masses. The processing slag is contained in large cup-shaped receptacles.

On an overhead platform, the molten metal is contained in ladles which rest in processing machines. These machines make it possible for the ladle to be motor-tilted and oscillated back and forth in two directions simultaneously. This control is developed through an operator located at a point where he has full vision of the processing machine.

The entire processing machine assembly is carried on a scale, and it is necessary to have the recording beam located at some distance from the processing machine. In order to obtain quick and accurate control of the weight of metal introduced into the processing slag, a photoelectric cell is attached to the beam assembly. When the proper amount of metal has been poured from the metal ladle, and the beam poises in equilibrium, the photoelectric cell signals the pouring operator, some 50 feet distant, through a lighting system, that the proper amount of metal has been introduced.

This permits the operator to keep his eye on the pouring metal while weighing. The light flashes directly in front of him but does not distract his attention from the pouring operation.



In processing Byers Genuine Wrought Iron, a predetermined quantity of highly refined molten iron is poured into liquid slag of exact composition. When the right amount of iron has been introduced, the scale beam interrupts the light path to a photoelectric cell and a signal light flashes on the operator's pulpit some 50 feet away

Synthetic Enamels

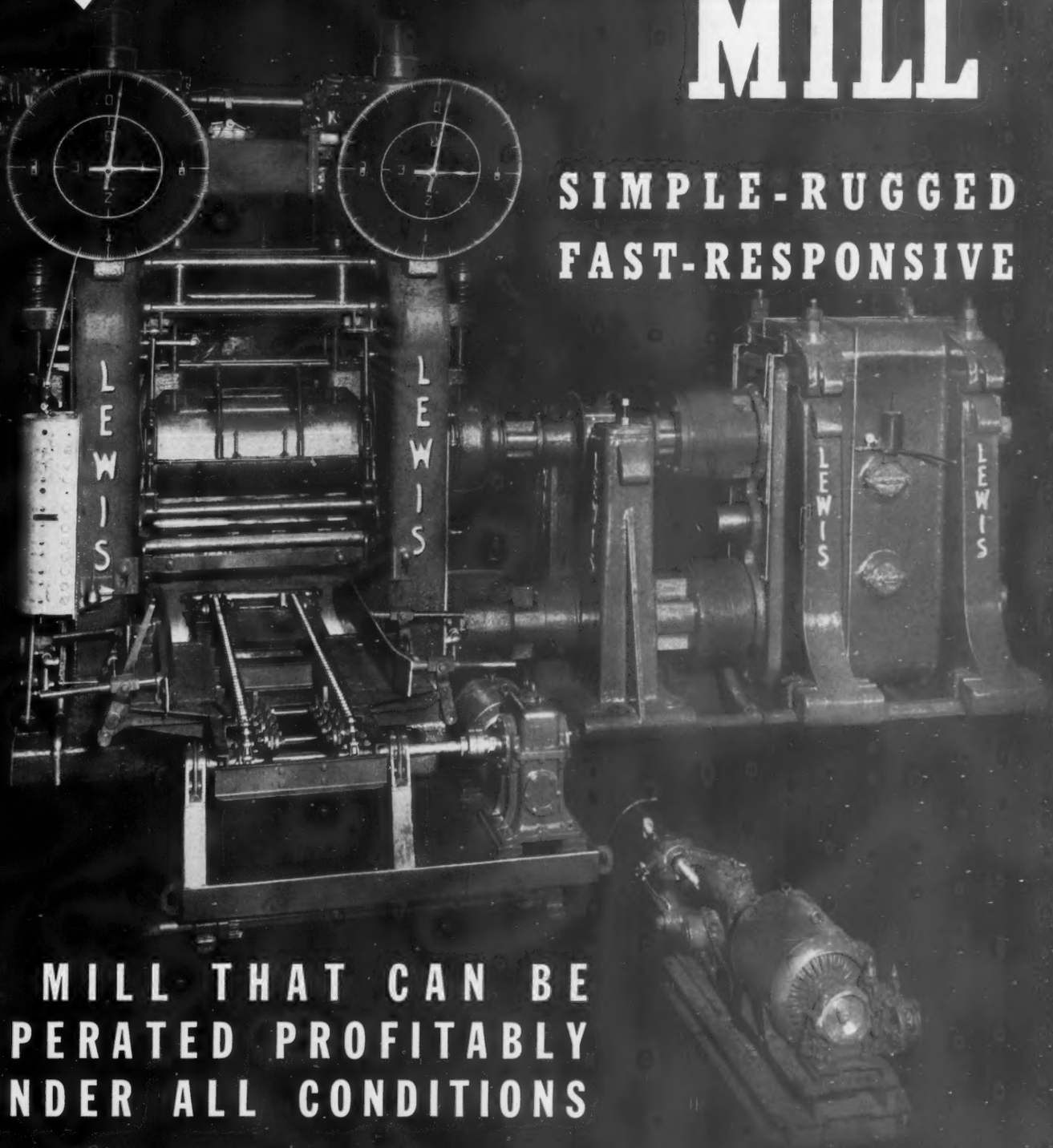
■ Synthetic enamels, known as Duart Wrinkle enamels, developed by Maas & Waldstein Co., Newark, N. J., bake out with a tough, durable characteristic wrinkle formation and are applicable not only to metals but to wood, leather and other materials.

A wide variety of patterns can be produced with each of the five grades of these enamels by varying the viscosity of the finish and the setting of the spray gun. These include "Sag" wrinkle, which has the appearance of draped curtains and "Pine Tree" wrinkle, which is formed by very small runs; both are produced by spraying vertical surfaces. "Birdseye" wrinkle must first be baked at 100 degrees Fahr. to set the eyes, and then is given a finish bake.

These enamels are obtainable in most of the opaque colors and others including white, brilliant light colors of all kinds, soft pastel shades, transparent colors and in clear. Since these enamels will cover surface defects, priming, sanding and preliminary operations for preparing a smooth surface are unnecessary. Coverage obtained is about 200 square feet per gallon.

LEWIS IMPROVED 3 HIGH MILL

SIMPLE-RUGGED
FAST-RESPONSIVE



A MILL THAT CAN BE
OPERATED PROFITABLY
UNDER ALL CONDITIONS

LEWIS FOUNDRY & MACHINE
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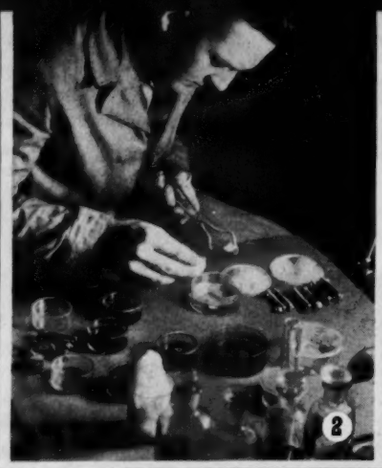
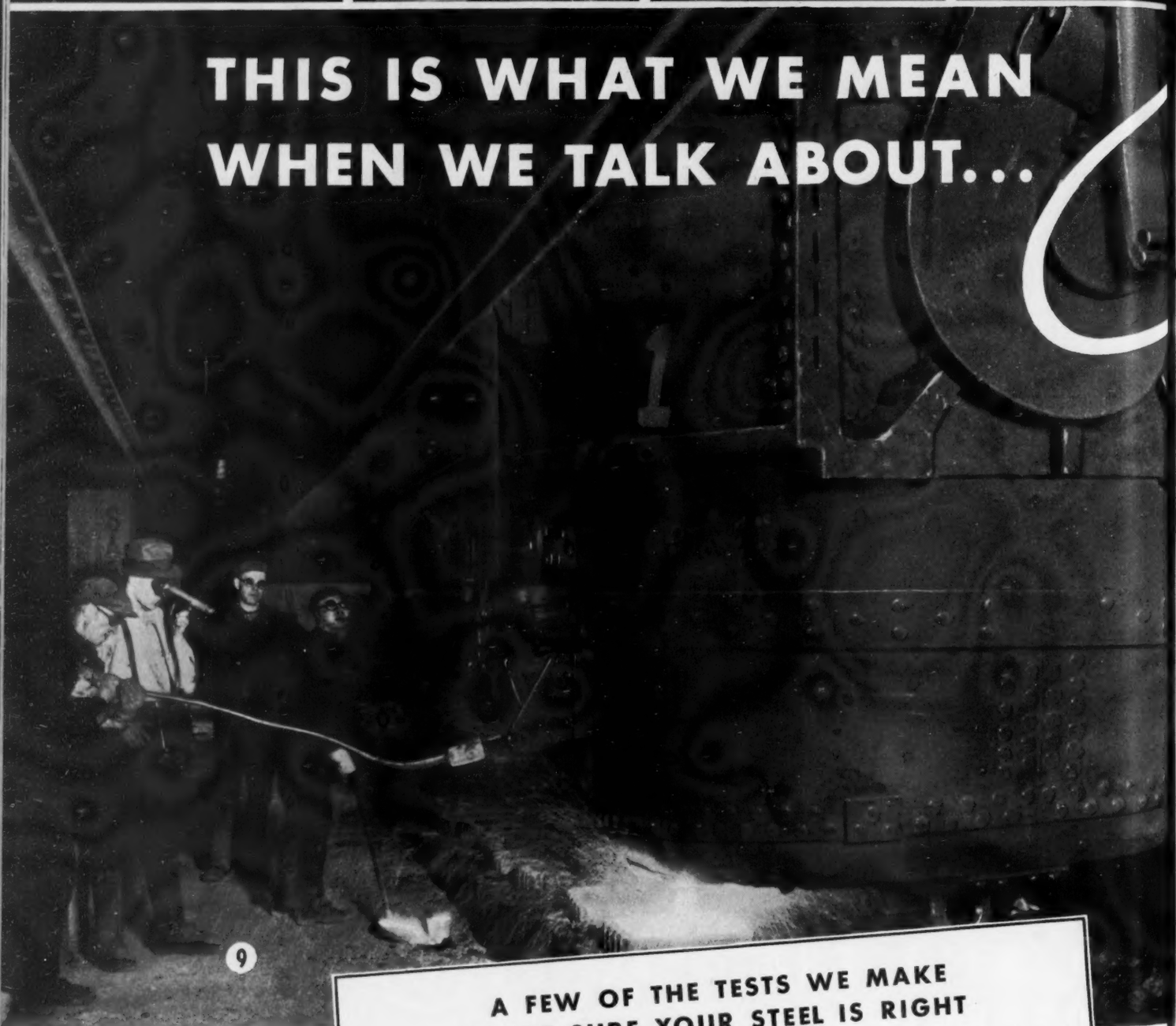


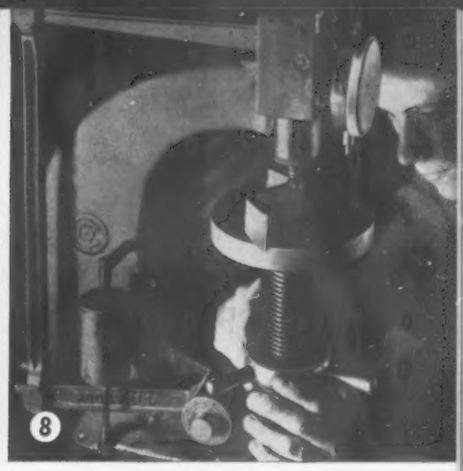
THIS IS WHAT WE MEAN WHEN WE TALK ABOUT...



A FEW OF THE TESTS WE MAKE TO BE SURE YOUR STEEL IS RIGHT

1. Heating small billet for experimental rolling on laboratory mill.
2. Etching a specimen of steel for subsequent examination under the microscope.
3. Carbometer test in open-hearth for carbon analysis.
4. Testing the behavior of steel under repeated alternating stress in fatigue machine.
5. Heating sample bar for experimental quenching and tempering.
6. Microscopic examination for grain size.
7. Ascertaining hardenability by examination of fractured samples and etched sections.
8. Rockwell test for hardness.
9. Metallurgical observer checking teeming temperature on pouring platform.

USS



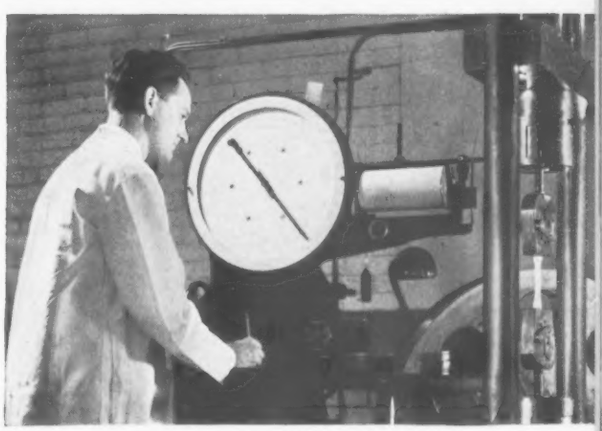
Controlled STEEL

IN steel making, chemical composition is important. But even more important is *how* that steel is produced—the metallurgical procedure.

That is why we long ago made it a point to find out how metallurgical practices affect steel—what physical and quality characteristics they impart—and how to *control* them . . . how to duplicate them consistently again and again.

This thorough, comprehensive and scientific control starts with the raw materials. It governs and records every detail of every operation through to the finished product. It even follows the steel into your plant, reports on its performance during the actual processing. It includes the extensive laboratory and mill tests shown here, and many more.

Thus in U·S·S CONTROLLED Steels we are able to furnish not only fine grain or coarse grain size as required . . . but we are able to maintain, in shipment after shipment, uniformity in forging and machining qualities, uniform response to heat treatment, uniform ductility, etc.—that make it possible to use the most productive tool set-ups, heat treating and forging procedures that, once established, will require minimum change. May we have the opportunity of showing you what U·S·S CONTROLLED Steels can do for you?



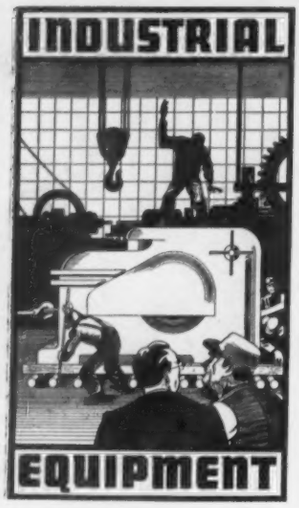
● Elastic limit determination for sheet steel.
● Taking exact measurements of strength and elastic properties with an extensometer.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



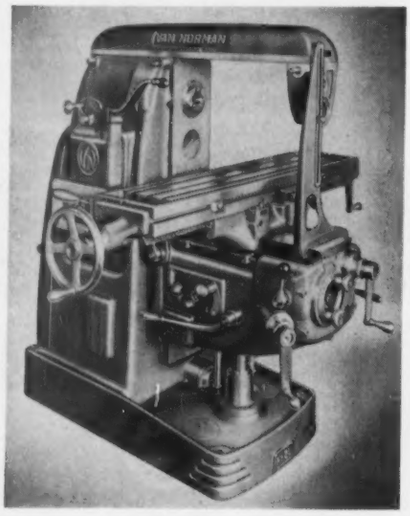
Welding-Tip Dresser

■ A dresser that remachines both upper and lower spot welding tips to their correct profile without necessitating removal of the tips from their water-cooled holders is announced by P. R. Mallory & Co., Inc., 3029 East Washington avenue,

Indianapolis. The new tool saves considerable time and insures the use of uniform contact area with the work. Lower dressing costs and better welds are also said to result.

Light Milling Machine

■ A light model milling machine plain or universal, No. 2-L, is offered by Van Norman Machine Tool Co., Springfield, Mass. Features include front and rear controls, 6-way rapid traverse, wide range of speeds

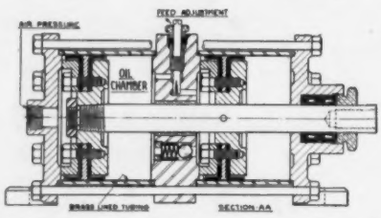


controlled by single-lever selector and modern design embodying exceptional rigidity and dependability.

The highest degree of precision, sensitivity, accuracy and compactness are claimed for this machine. The 18 spindle speeds range from 30 to 1450 revolutions per minute and the 12 table feeds from ½ to 36 inches. Table size is 45 x 10 inches.

Cylinders Combine Air And Hydraulic Pressure

■ A complete new line of Air-Draulic cylinders using a combination of air and hydraulic pressure for power is announced by Logans-



port Machine Inc., Logansport, Ind. These cylinders were developed to provide the smooth, steady action of a hydraulic cylinder to an air-operated cylinder.

It is claimed the piston can be accurately controlled at all speeds up to the maximum, making these cylinders suitable for operating milling machine tables, drill spindles, sliding table and other tools.

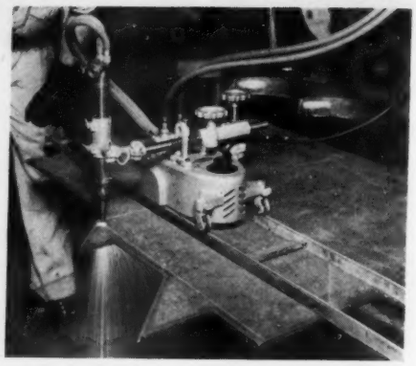
Inspector's Hammer

■ M. E. Cunningham Co., 172 East Carson street, Pittsburgh, has developed an inspector's hammer for

marking metals, timber and other hard materials. Interchangeable plugs are fitted on either end of the hammer and are held in place by special spring pins, making it possible to have a company insignia on one end and a chisel or prick edge (for determining blowholes in castings, etc.) in the other. Special inserts can be made for any desired trademarks or symbols.

Portable Cutting Machine

■ National Cylinder Gas Co., 205 West Wacker drive, Chicago, announces No. 5 motor-driven portable oxyacetylene cutting machine for



cutting straight lines of any length with a square or beveled edge. It also cuts circles ranging from 3 to 89 inches in diameter with square or beveled edge, and irregular outlines to a limited degree. Its features include better balance, motor insulation, handier controls and light weight.

Welding Fitting Has Forged Annular Lip

■ Taylor Forge & Pipe Works, P. O. Box 485, Chicago, has developed "Centring" WeldELL, seamless forged steel welding fitting with an-

nular lip forged integral. By centering fitting in pipe, lip eliminates need for backing rings, clamps and guides for holding fittings in position and is said to simplify pipe welding. Ring remains cooler during welding than molten weld metal, so bottom of V appears darker than sides. This color contrast is said to be a guide to welder, permitting him to obtain complete penetration without burning through.

New Line of Synchronous Inductor Motors

■ A new line of alternating-current fractional-horsepower motors is announced by General Electric Co., Schenectady, N. Y., for use on indicating and recording instruments, small regulating or control devices, remote control devices and similar applications. Designated as synchronous self-starting inductor motors, they are especially applicable within their capacity wherever a source of low-speed torque or power at constant speed is needed. The

What Design Engineers are doing with Silverlink Roller Chain!

DRIVE COSTS SLASHED

Empire Sheet & Tin Plate Co. in the modernization of their Mansfield, Ohio plant used Silverlink roller chain drives to improve their cold-rolling mill operation. As compared to gear drives, their smoother operation resulted in a better finish of steel plates; maintenance expense was greatly reduced and the initial cost was only one-ninth as much as gears.

Ice Cubes from block ice . . . Safer and Faster!

An ice cubing machine that automatically cuts a 325-lb. block of ice into cubes in six or seven minutes was developed by the M. J. Uline Co. In this machine, Silverlink roller chain is used to lift the ice to the saws and for moving the saw carriages back and forth across the ice. This ingenious machine saves fingers and prevents injured hands besides speeding up ice cube production.

L-B takes its own medicine!

In designing its new two-roll spring relief coal crusher, Link-Belt has used a Silverlink roller chain drive. This type of drive provides such advantages as easier and greater size adjustability and a more uniform product due to smoother operation and absence of backlash.

THE kind of service you want is the kind you get when you specify Silverlink roller chain. Whether your chain is to be used to carry heavy loads at moderate speeds, such as on second reduction drives and similar applications; for intermediate built-in drives; for coordinating the motion of widely separated shafts, within the machine, where the close regulation of machine speeds is of great importance; or for conveying applications, you'll find Silverlink ready to do more than you will ever ask of it.

It's an engineered roller chain—one that has been built to precision accuracy in every detail. Don't ask for just roller chain—say Link-Belt Silverlink and be certain of receiving more than your money's worth.

Complete drives — chains and sprockets — from ¼ to 225 H.P., in speed ratios 1:1 up to 8:1, are stocked by distributors nationally. Write for Engineering Data Book No. 1757 today!

Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto. Branch offices and distributors in principal cities. 7771

LINK-BELT *Silverlink* ROLLER CHAIN

motors are built in two-frame sizes. In the larger frame size, two motors are available, one delivering 40 ounce-inches torque at 75 revolutions per minute and the other delivering 75 ounce-inches at the same speed. In the smaller frame size, four motors are available: a 100-revolution-per-minute motor which delivers 2 ounce-inches torque, and three motors with built-in gear reduction. The latter are offered in the following torques and speeds: 48 ounce-inches at one revolution per minute; 24 ounce-inches at 2 revolutions per minute; and 12 ounce-inches at 4 revolutions per minute. All of these motors, in both frame sizes, are of the permanent split-capacitor type with separately mounted Pyranol capacitors. The new motors are essentially inductor alternators operated as motors with an Alnico permanent magnetic field replacing the usual direct-current excited field. They are self-starting and have rapid acceleration and deceleration.

Two-Lap Gear Lapper

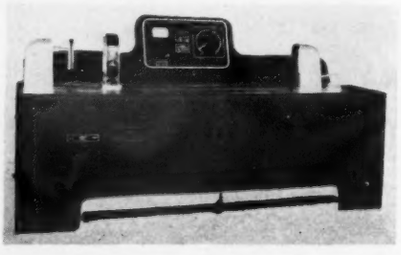
■ Michigan Tool Co., 7200 East Six Mile road, Detroit, offers a new line of gear lappers of the two-lap type employing the crossed-axis method of operation. Automatic in operation, the machines are available in both vertical and horizontal models.

The new machines are provided with electrical controls which permit adjustment of the lapping cycle to meet virtually every possible variation desired. The new line is designed for high production lapping of moderate and small sized gears (½ to 8-inch diameter) and is not restricted as to pitch of gears which may be lapped. Machines are also available in 1 to 12-inch capacities.

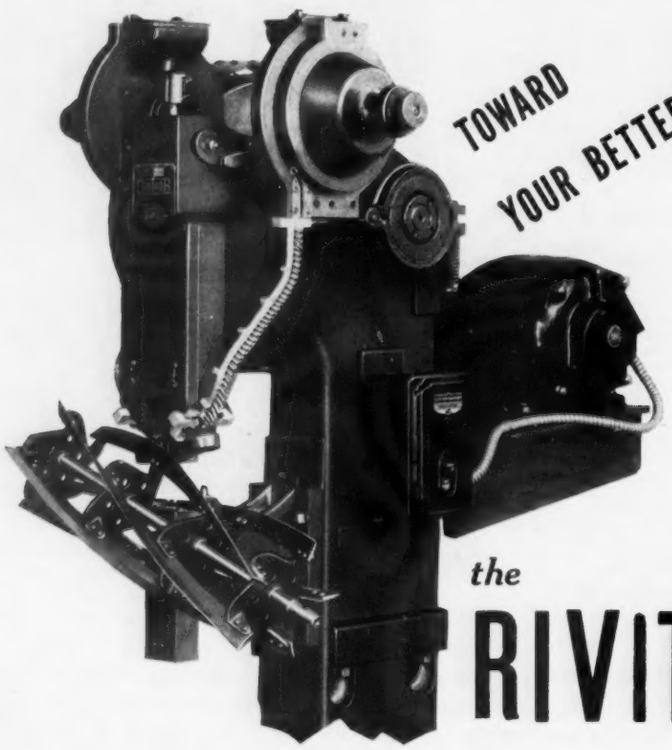
A relatively low surface speed with high speed of reciprocation of the laps across the gear faces is employed. By a single adjustment, speed can be varied from 90 to 300 reciprocations per minute. Lap spindle may be operated at speeds ranging from 52 to 283 revolutions per minute through a change-gear box. A third adjustment permits selection of desired reciprocating stroke length.

Transformer-Operated Magnetizing Units

■ Magnaflux Corp., 25 West Forty-third street, New York, announces two new transformer-operated magnetizing units for magnetizing and demagnitizing. The DT type illustrated here will handle parts up to 72 inches long and is used in aircraft and automotive fields. The wet method of inspection can be applied while the magnetizing current is on and the part is in the machine. The detection liquid is flowed over the part by means of a nozzle connected to a tank and pump which are integral parts of the unit.



Type TF-203 is for small parts



effects a stronger riveted joint at rates up to 3200 rivets an hour and creates additional savings by making possible the use of solid rivets.

The riveting is accomplished smoothly, automatically and with precision. The setting action is actually one of "Coining". The motion proceeds from a fast approach to the riveting position to a slower setting action—giving the metal time to flow.

The Rivitor is shown here "staking" $\frac{3}{16}$" x $\frac{5}{8}$" lg. solid rivets for reel and blade assembly.

These machines ably handle many jobs in many industries. Submit samples of your riveting jobs. We should like to show you the type of solid rivet joints that can be effected automatically. We should like you to realize savings that will help you *toward your better product.*

this is a* TOMKINS-JOHNSON *product

Factory at 611 N. Mechanic St., Jackson, Michigan. Agents in principal cities. T-J products also include Air and Hydraulic Cylinders . . . . Remote Control Systems . . . . Rotating Chucks and Cylinders . . . . Clinchors . . . . Special Equipment . . . . Brownie Coolant Pumps . . . . T-J Die Sinking Milling Cutters.

GOOD WILL BASED ON GOOD STEEL

Old, AND TRUE

"Whatever Is Worth Doing At All, Is Worth Doing Well"

Upon this premise, The Timken Company continues year after year to build "good will based on good steel".

It is no "happenstance" that the name TIMKEN is today the hallmark of quality in the steel-making industry. Chemical control, metallography, physical testing, carbon control, temperature control, slag control and research are used exhaustively in the production of TIMKEN Quality Steel.

Whatever your application may be, remember: If it's worth making, it is worthy of TIMKEN Quality Alloy Steel.

VISIT TIMKEN at the American Society for Metals Exhibit CHICAGO October 23-27 SPACE D117

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

TIMKEN
ALLOY STEELS

not exceeding 20 inches in length. It functions quite similarly to the DT type, except that the coil serves as a demagnetizer and the tank and pump features are not included. This unit has been adapted for tool, pipe machinery items and other small parts.

Twin-Filter Respirator

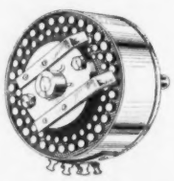
■ The new twin-filter Skin-A-Cat respirator made by H. S. Cover, South Bend, Ind., with U. S. Bureau of Mines approval B. M. 2129 for type "A," pneumoconiosis or silicosis producing dusts, has 40 square inches of filtration area and requires no filter plates. Filters, which are held in place by newly patented adjustable tubular connections, resemble miniature sofa cushions which always stay flexed without necessity of spacing devices or dividing segments. They cannot choke or collapse, and make possible freer breathing, due to the filters' being turned inside out before being attached to respirator face piece.

Putting the seams on the inside gives the filter a well inflated appearance and always keeps it at top efficiency. Two check valves and an exhalation valve prevent collecting of moisture and rebreathing of vitiated air. The rubber face piece

makes an air-tight fit on any face and face cloth gives protection against dermatitis. Entire respirator is of unbreakable construction.

Stud-Type Attenuator

■ International Resistance Co., 401 North Broad street, Philadelphia, announces stud-type attenuator B-31 especially suited for low level work. The spiral clockspring connector used in each arm of bridged "T" eliminates two series pressure con-



tacts and makes possible maintained low noise level. Noise is further reduced by contact of laminated beryllium copper operating over beryllium copper contact studs. Thirty-step attenuation is provided. Removable aluminum cover provides complete protection against dust and dirt. Unit is 2 inches long by 2¾ inches in diameter.

Indirect Air Heater

■ The new indirect air heater built by Despatch Oven Co., 922 Ninth street South East, Minneapolis, is claimed to eliminate the usual cleaning maintenance because of a special proportioning type burner and vertical "self-cleaning" tubes used. Burn-outs are eliminated through use of a heavy nickel chromium alloy protection plate that is mounted directly over the combustion chamber and which serves as the bottom header plate for the heater exchanger tubes. This plate takes all the radiant heat and flame impingement and prolongs the life of the tubes. The heater does not require frequent adjusting of burners, and a given fuel-air ratio remains constant whether the burner is on high or low fire. Low-pressure air is used instead of high, and through use of a small low-

ATLAS GAS-ELECTRIC LOCOMOTIVES

45 Ton Locomotive especially suitable for economical interplant switching service.

OTHER ATLAS PRODUCTS

Gas-Electric and Diesel-Electric Locomotives . . . Electric Transfer Cars for Blast Furnaces and Steel Plants . . . Stockhouse Scale Cars for Blast Furnaces . . . Concentrate and Calcine Cars for Copper Refineries . . . Automatic and Remote Controlled Electric Cars . . . Pushers, Levellers and Door Extractors . . . Coal Charging Lorries, Coke Guides and Clay Carriers . . . Atlas Patented Coke Quenching Cars for By-Product Coke Ovens . . . Atlas Patented Indicating and Recording Scales . . . Special Cars and Electrically Operated Cars for every conceivable Purpose.

THE ATLAS CAR & MFG. CO.

Engineers . . . Manufacturers

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Advertisement

COPPER ALLOY BULLETIN

Reporting News and Technical Developments of Copper and Copper-Base Alloys

OCTOBER "Bridgeport" BRASS CO. 1939

HOT FORGING GAINS IN POPULARITY FOR PRODUCTION OF STRONG, DUCTILE PARTS

Alloys Can be Adapted to Give Wide Range of Physical Characteristics

The fabrication of non-ferrous metal parts by hot forging processes is receiving increased attention, because of the possibilities offered by the excellent hot forging equipment now available. The method is related to the hot working processes which are used in the earlier stages of the fabrication of sheet, rod, and wire that are ultimately finished by cold working. Equipment recently developed is more positive in action than drop forging equipment, and permits fairly close control of dimensions.

Hot forgings have certain inherent properties which are of value when compared with castings and screw machine parts. As compared with castings, forgings have greater strength and ductility. They have higher resistance to impact and are generally tougher, because of the absence of the porosity common to many castings. These advantages over castings are partly mechanical and partly metallurgical. The forging action tends to close up any voids which may have existed in the original cast billet, and the effect of the combined working and heating brings about a refining of the grain, producing a tougher metal.

Tougher than Screw Machine Parts

Hot forgings are generally tougher than screw machine parts, because they are in the annealed condition as forged. For the same reason, alloys of the same general type may have lower strength as forged. There are alloys, however, that can be hot forged which are of higher strength than most screw machine rod. Another advantage of hot forging is the reduction in scrap formed in processing on certain shapes and hollow sections.

Primarily, the economy of hot forgings depends on the quantity of pieces involved, as the tool cost is high. The larger the quantity, the greater the economies.

Lead may be Added for Free Cutting

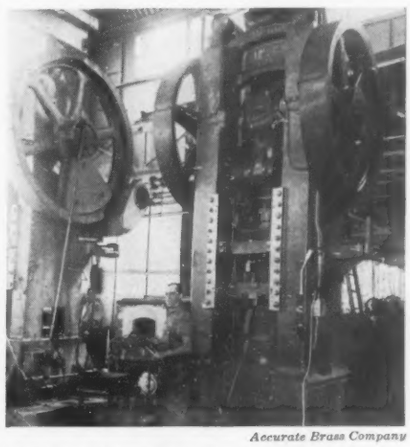
There are a number of alloys available for hot forging. Until fairly recently these alloys were all of the Muntz metal type (60% copper, 40% zinc). The reason for this lies in the excellent hot working characteristics of the Muntz metal alloys. Certain special requirements, such as free machining, have led to the use of other alloying elements. In fact, free cutting is so generally desirable that the standard forging brass contains from 1.5 to 2.5% lead, 60% copper, and the remainder zinc. The amount of lead that can be added is limited by the severity of the hot forging operation. Higher lead contents would be desirable from the machining standpoint, but would interfere with normal hot working characteristics. Close control of the copper content is essential in the more difficult operations, as is control of the forging temperature. The lead content has comparatively little effect on strength and ductility. Both the standard forging alloys and Muntz metal are useful when exceptionally high strength is not a vital factor.

Alloys of higher strength as forged are made by adding other elements to the basic Muntz metal alloys. One of these

(Continued on Following Page, Column 1)

Memos on Brass—No. 2

Brass is used in many applications because of the decorative note offered by its colorful, gleaming surface. It lends itself readily to buffing and polishing operations that produce a high sheen, or to electroplating with other metals, such as nickel or chromium-over-nickel.



Accurate Brass Company

Modern equipment and the wide range of alloys available have broadened the possibilities of the hot forging process.

ERICKSON CUP TEST SHOWS DUCTILITY OF METALS

Reveals Importance of Grain Size In Metal Forming Operations

The Erickson Cupping Test consists in pushing a blunt round-nosed punch against a piece of tightly clamped sheet metal, thus producing a shallow cup the depth of which depends on how much the metal will stretch before fracture. The more ductile the metal, the deeper the cup.

Unlike most physical tests, the Erickson cup closely approaches the operation for which the metal is intended. It is excellent for judging the ductility of sheet metal used for making automobile lamp bodies and reflectors involving both stretching and forming operations. Annealed brass with a fairly fine and uniform grain structure produces a deep Erickson cup with a smooth surface. Coarse grained annealed brass makes an Erickson cup with a rough, grainy "orange peel" surface. Such metal will inevitably form a lamp reflector or body with a rough surface which is not

(Continued on Following Page, Column 2)

Methods of Welding Copper

Practical suggestions for overcoming some of the difficulties in welding copper are suggested in a recent article. According to the author, the problem introduced by the high thermal conductivity of copper can be overcome by covering the surface with asbestos and using a high rate of heat input. Deoxidized copper should be used, and a deoxidizer in the welding rod is also desirable. Amount of deoxidizer, however, is limited by the effect on electrical properties. A neutral welding flame is recommended, as an excess of oxygen will form oxides in the weld metal, and a reducing flame will cause the copper to absorb carbon monoxide, carbon dioxide, and hydrogen. Peening of the weld while it is still hot is reported to result in increasing the strength of the weld.

Ferric Sulphate for Pickling

The use of ferric sulphate as an oxidizer in pickling baths for copper alloys is reported to result in less pitting and etching than the more commonly used nitric acid or sodium bichromate, because of its milder action.

COPPER ALLOY BULLETIN

HOT FORGING PROCESS

(Continued from Preceding Page, Column 2)

alloys is known as manganese bronze and contains appreciable quantities of iron, tin, and manganese. Modifications of this alloy to obtain even higher strengths are made, in which the amounts of iron and manganese are increased and aluminum is added also. While the copper content of the latter alloy is higher than the usual Muntz metal, the structure obtained is still characteristic of Muntz metal. In all of these higher strength alloys there are only small quantities of lead, and their machinability is not as good as that of the standard forging alloy—although they can be machined.

Higher Copper Content Alloys

Another group of alloys which are readily hot forged are the higher copper content solid solution alloys. In this group is pure copper, which is used in cases where high electrical conductivity is necessary. Duronze* I and II are also in this group. These alloys are silicon bronzes which have slightly higher strengths than the standard forging alloy, and are more resistant to corrosion than any of the Muntz metal group.

Another type of forging alloy recently developed is Duronze III. This is a copper base alloy containing about 7% aluminum and 2% silicon. In the hot forged condition it has a tensile strength of approximately 85,000 to 90,000 pounds per square inch. In addition, it is more readily machined than the higher strength alloys of the Muntz type. In corrosion resistance it is superior to the Muntz metal alloys and comparable with the silicon bronze alloys.

All of these alloys are to be covered by A. S. T. M. specifications for Forging Rod, which are being published as a tentative standard.

There are many applications in which hot forgings may be used with excellent results. Many types of building hardware, bolts, fittings, clamps, gear blanks, and bushings form possible applications.

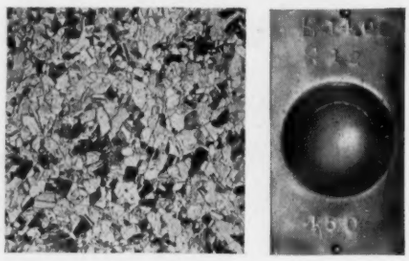
From the wide range of hot forging alloys available, it is possible to select the one best suited for a specific purpose—whether it is required merely that the alloy be readily forged, or certain specific properties are needed in the finished forging. Bridgeport will gladly consult with fabricators on the selection of alloys for specific hot forging requirements.

ERICKSON CUP TEST

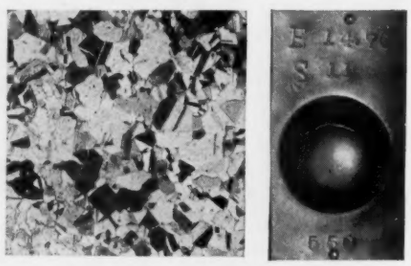
(Continued from Preceding Page, Column 3)

satisfactory, because it requires excessive polishing and buffing. Cold rolled metal produces a very shallow Erickson cup.

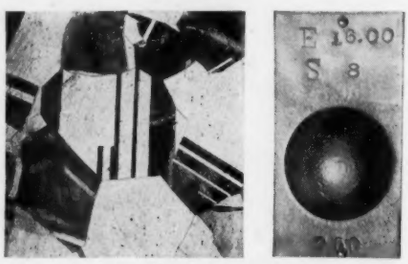
It will be seen that the Erickson cup is an indication of grain size. The Erickson test, however, can be made more quickly than preparing metal for a microscopic examination, and is often used in the brass mill for testing reflector or drawing brass. The Erickson test may also reveal the presence of surface defects on metal, such as seams, scratches, and blisters, which are greatly emphasized when metal is stretched.



Fine grain



Medium grain



Coarse grain

These views show the micrographs of fine, medium, and coarse grain brass (left) and the Erickson cup produced by each (right). Micrographs are 75X; cups are reduced in size about one-half.

NEW DEVELOPMENTS

This column lists items manufactured or developed by many different sources. Further information on any of these items may be obtained by writing the Bridgeport Brass Company, which will gladly refer readers to the manufacturer or other source.

An insulating material protects racks against attack by cleaning and plating solutions, according to the manufacturer. It is a liquid, applied by dipping and forced drying for one hour at about 200 degrees F. Ten coats are usually applied.

A burnishing machine is said to be suitable for cleaning pipe fittings before soldering. Burnishing is done by steel wool tape, which is available in one grade for copper and another for brass. Tape is wound on chucks that provide a cylindrical surface for cleaning interior surface.

A welding blowpipe is said to be suitable for medium-range welding in the manufacture of metal products, installation of piping, and repair of parts made of copper, brass, or other metals that can be welded. A mixer in each welding head permits accurate control of welding flame. It is reported to be satisfactory for metal ranging from 25 gage to ½ inch in thickness.

Immersion heaters for all types of electroplating baths are now on the market. It is said that they are easy to apply over the side of the plating tank. Advantages claimed for warming of plating solutions are: increased solubility of salts, permitting higher concentrations and higher current densities; increased conductivity, which reduces tendency to building up of deposits in spots; and decreased occlusion of hydrogen.

A chipping hammer is combined with a wire brush in a new handy aid for welders. Drop forged steel hammer can be used to break and chip welding scale. Tool can then be turned in the hand and the brush used to clean the surface. Brush is renewable.

Continuous plating of copper wire for applications where coating with another metallic finish is desired is reported possible with machines that can be furnished for single or multiple operations. It is said that arrangement is sufficiently flexible to permit different types of treatment on different wires.

A one-dip degreaser is adaptable to cup-shaped work, reports the manufacturer. Rotating basket design is said to give important economies on work which would otherwise trap the solvent.

A new solvent is said to combine detergent qualities of soap and water with high solvent performance. Stampings, extruded shapes, or die-cast parts assume a clean appearance without etching or loss of weight. Sluicing with water is reported to give a chemically clean surface for lacquering operations.

PRODUCTS OF THE BRIDGEPORT BRASS COMPANY

Executive Offices: BRIDGEPORT, CONN.—Branch Offices and Warehouses in Principal Cities

SHEETS, ROLLS, STRIPS—*Brass, bronze, copper, Duronze,** for stamping, deep drawing, forming and spinning.

CONDENSER, HEAT EXCHANGER, SUGAR TUBES—For steam surface condensers, heat exchangers; oil refineries, and process industries.

PHONO-ELECTRIC* ALLOYS—High-strength bronze trolley, messenger wire and cable.

WELDING ROD—For repairing cast iron and steel, fabricating silicon bronze tanks.

LEDRITE* ROD—For making automatic screw machine products.

BRASS "Bridgeport" CO.

Established 1865

COPPER WATER TUBE AND FITTINGS—For plumbing, heating, underground piping.

DURONZE ALLOYS—High-strength silicon bronzes for corrosion-resistant connectors, marine hardware; *hot rolled sheets* for tanks, boilers, heaters, flues, ducts, flashings.

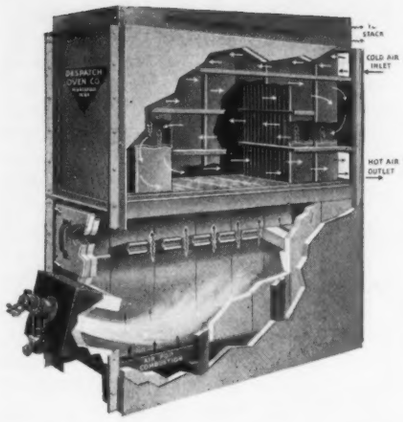
BRASS, BRONZE, DURONZE WIRE—For cap and machine screws, wood screws, rivets, bolts, nuts.

FABRICATING SERVICE DEPT.—Engineering staff, special equipment for making parts or complete items.

BRASS AND COPPER PIPE—"Plumrite"* for plumbing, underground and industrial services.

*Trade-name.

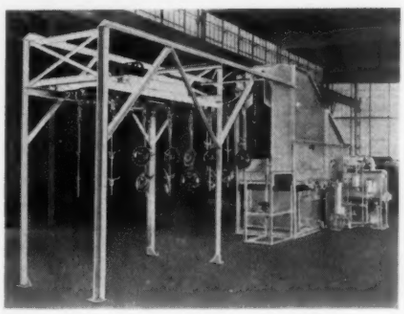
BRIDGEPORT BRASS



pressure blower with the heater, it is possible to reduce the air cost approximately half.

One-Dip Degreaser

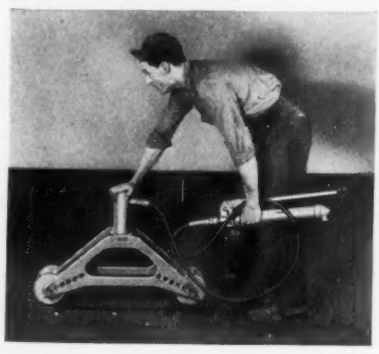
■ Detroit Rex Products Co., 13005 Hillview avenue, Detroit, offers a one-dip, liquid-vapor degreaser designed for infrequent cleaning periods of about once every 2½ months. Cleaning cycle consists of immersing the work in boiling solvent and passing it out through solvent vapors. Solvent still and filter remove all oil and insoluble contamination so that boiling chamber, which holds 188 gallons and is capable of holding all solvent from the machine, is always full of clean



solvent. At the exit end of the degreaser, there is a light oil spray system to rust-proof the work.

Pipe Bender

■ "Porto-Power" pipe bender, model S-36, handling seven sizes of rigid conduit and pipe, including 1¼, 1½, 2, 2½, 3, 3½ and 4-inch

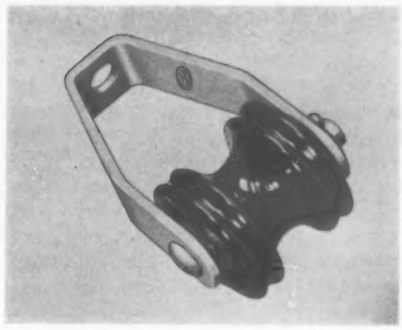


diameters, is announced by Blackhawk Mfg. Co., 116 North Broadway, Milwaukee.

Weighing 190 pounds, this bender uses a 20-ton hydraulic unit. Simplified one-piece bending ram eliminates 13 various extension bars, tension arms, studs, etc., used in the original 1 to 2-inch Porto-Power bender.

3-Inch Spool and Clevis

■ Ohio Brass Co., Mansfield, O., offers a 3-inch spool and a clevis assembly using spool insulator illustrated. The spool is suitable for



secondary racks and the complete insulated clevis assembly is for

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The BRASSERT Blast Furnace CINDER NOTCH STOPPER

Advantages of the

BRASSERT CINDER NOTCH STOPPER

- Assures Operator's Safety
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- Adjustable Stroke and Pressure
- Low First Cost
- Simplified Operation
- Rugged Construction
- Positive, Straight-Line Motion in opening or closing
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PLANT engineers and operating men have been quick to appraise the improved safety and power features of the Brassert blast furnace Cinder Notch Stopper.

They have demonstrated that this carefully-designed mechanism materially contributes to better furnace operation, reducing accident risk and effectively performing its function at low cost.

For complete information on the Brassert Cinder Notch Stopper, address our Chicago or Pittsburgh offices. Ask for Bulletin K.

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dead-ending secondaries and neutral conductors, turning angles, and filling various other requirements.

Made of wet-process porcelain, the same as used for high-voltage insulators, the spool has high electrical and mechanical values. It has a tapered hole which distributes mechanical loads more evenly and minimizes the possibility of spool breakage. The clevis is made of hot-dipped and galvanized steel.

Pressure Regulator

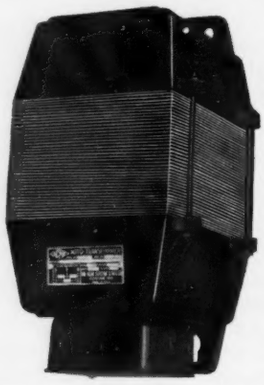
■ Minneapolis-Honeywell Regulator Co., 2709 Fourth avenue south, Minneapolis, has developed P212A static pressure regulator for use in conjunction with a Series 60 Floating device to control the static pressure in the discharge duct of

a fan system and for similar applications where definite static pressure conditions are to be maintained.

When tank contains 1 gallon Finol, positive pressure ranges from 0 to ¾-inch water column (including differential) and negative pressure from 0 to 1 inch water column (including differential). Movable weights adjust pressure range, and adjustable contacts and spring set differential. Case is 8½ inches high, 16 inches wide and 6¾ inches deep. Regulator is mounted on wall or duct by means of four holes.

Power Transformer

■ A new line of air-cooled power transformers is announced by Acme Electric & Mfg. Co., 1440 Hamilton, Cleveland. Three separate stream-



lined models cover all standard voltage characteristics from ¾ to 10 kilovolt-amperes in auto and insulated types. Full air draft external ventilation, specially wound hand finished coils insulated between layers with high dielectric strength insulating materials and cores of thin gage low-loss steel are included. These transformers are adapted for industrial application where oil-cooled transformers may affect the fire risk.

A. C. Arc Welder

■ Hobart Bros. Co., Troy, O., has developed an alternating current arc welder, Transarc, having range of 20 to 200 amperes and for use on

Put Your Sheet Problems up to NEWPORT

Fifty years devoted to the production of high quality iron and steel sheets have given Newport very definite ideas about the "right sheet for every job" and the application of Newport sheets for the diversified requirements of industry.

Many users have found it profitable to select Newport as their chief source of supply, thereby enjoying the quality advantages of product specialization and precision manufacturing, and the benefits of Newport metallurgical research and development.

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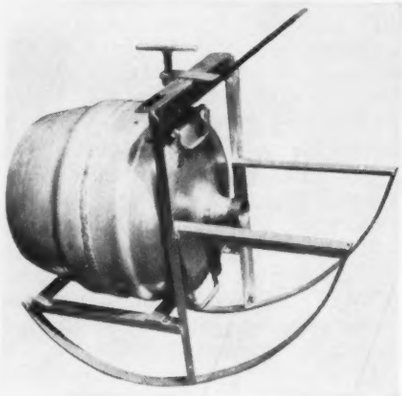
ANDREWS PRODUCTS IN CARBON AND ALLOY STEEL: Blooms • Forging Billets • Re-rolling Billets • Slabs • Universal Mill Plates • Sheet Bars.

220-volt, 60 cycles. Unit has no electrical or mechanical connections between power lines and welding leads. Efficiency is 95 per cent measured by kilowatt input. Striking or arc-holding voltage increases as welding rate is reduced making arc stable and easy to hold under all conditions. Welding current is adjusted in large number of steps. Hand grips for lifting unit are provided on each side.

Carboy Pourer

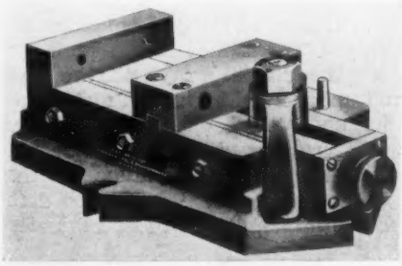
■ Lewis-Shepard Sales Corp., Watertown, Mass., announces lightweight safety carboy pourer which can be handled by one man. With



carboy resting on its base, pourer is placed over top and clamped securely by means of threaded handle just below shoulder. Easy pull on handle brings carboy over into pouring position, resting on broad rocker base. Pulling pourer still further until it rests upon handle permits complete drainage of carboy.

Production Vise

■ Chicago Tool & Engineering Co., 8389 South Chicago avenue, Chicago, announces a 2½-inch production vise for high production in milling, drilling and grinding operations. Adjustable cam locking lever works against a hardened



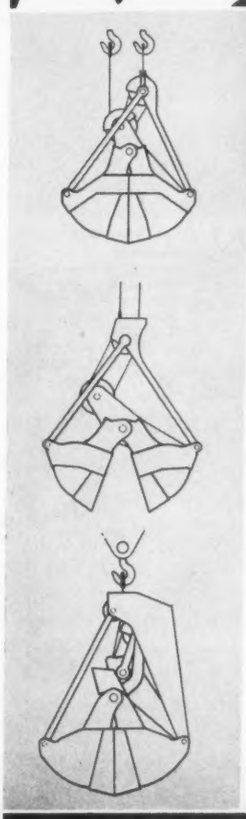
steel surface permitting speedy loading and unloading by a single movement of the lever.

The vise has a hand screw for quick adjustment. Lugs on sides and ends provide secure bolting to the machine table. Adjustable plates permit side wear to be taken up. Cost is $19.50 F.O.B. Chicago.

Pushbuttons

■ A new line of standard duty pushbuttons for alternating and direct current pilot circuits, supplied in surface and flush mounting and for special applications, is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Double-break, silver-plated copper contacts give long life, and the drawn steel cases and modern molded covers eliminate sharp corners. Shrouded for protection against accidental operation, large buttons are easy to press, even with gloved hands. Terminals and knockouts in top and bottom are clearly marked for easy installation.

Other special members of the line are watertight and flush-mounting stations, units with rotary selector switch and stations with safety latch to protect against closing of circuit by another operator or from another control point.



"This 2-line hook-on bucket, used where 2 hook blocks are available, is especially advantageous because:

It is a simple, rugged design having few parts—maintenance expense is low.

It is very easy for the crane operator to handle in picking up and discharging loads."

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BUCKETS
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Multiple Spot Welding

(*Concluded from Page 66*)

matic repeating cycle at any time by releasing the foot pedal control.

After the chamber is spot welded, edges of the chamber are seam-welded (internal pressures at edge are not as high) and all "plumbing" joints are silver soldered. Then units are subjected to a 100-per-cent leak test at a pressure of 200 pounds per square inch. Samples are periodically tested to destruction to check whether the units are meeting the 600-pound test as per specifications.

Before installation, the chambers are formed into U-shape as shown at the center of Fig. 1.

Welding Compound

■ A new compound known as Protect-O-Metal, introduced by K. W. Smith & Sons, Dayton, O., as an aid in welding and die casting, is claimed to check friction, corrosion and adhesion present in high heat processes. It is said to prevent spatter on the surface surrounding the weld. In die-casting, when the compound is sprayed or brushed on a die, it forms a heat resistive coating which prevents molten metal from sticking to solid metal and allows ejection of castings. Compound also is recommended for deep-drawing dies, permanent molds and drop forging.

New Hard-Solder Flux

■ A fast-acting flux to speed up silver and hard solder applications where low temperatures are essential has been developed by Lloyd S. Johnson Co., 2241 Indiana avenue, Chicago.

Known as Lloyd's No. 7 silver and hard solder flux, the flux has a fusing action that begins at 850 degrees Fahr. At 1150 degrees Fahr. it becomes thoroughly liquid and continues to flow evenly. It maintains its volume at 1600 degrees and upwards without breaking down or dissipating itself before thorcugh cleansing of oxides and other foreign matter from the metal surface has been accomplished. It is said not to splatter excessively or bubble unduly at high temperatures.

Because of its capillary action, the flux is claimed to pull solder quickly and uniformly through lap and butt joints and to form a bond free from lumps and pits. Quickly soluble in water, the excess flux washes off easily from finished work. It is recommended for soldering stainless steel, monel, copper, brass, nickel, bronze, ferrous and nonferrous metals and their various alloys.

Coated Copper Retains Brilliancy Outdoors

■ On the exterior of its buildings at the New York World's fair, General Electric Co., Schenectady, N. Y., placed 26,500 square feet of copper panels coated with Glyptal, an alkyd resin coating which it developed. The surfaces of the panels are cross-crimped to produce striking effects with the shifting rays of the sun and under floodlighting at night. Unlike uncoated copper which would have turned green or showed brown spots soon after exposure to the weather, the coated panels to date have retained their brilliant luster and characteristic color.

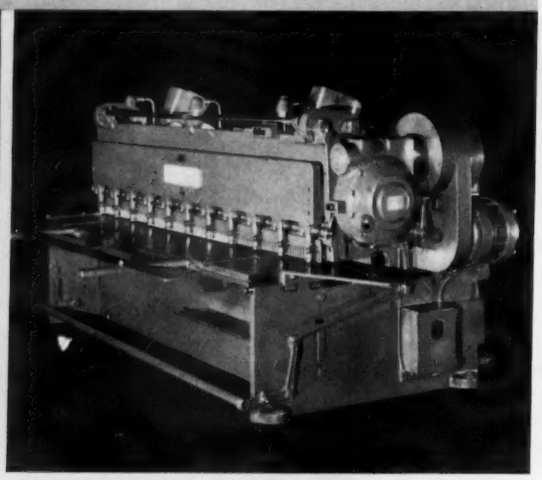
The ability of these coated copper panels to retain their finish when exposed to the weather suggests to the company that copper might have wider application as a building material.

RIGHT—LOOKING WELDING MAKES A BETTER LOOKING PRODUCT

And, eye appeal makes any product just a little easier to sell.

Many makers of welded equipment realize this fact and rely on Murex Electrodes for the sort of welding that is not only sound, and lives up to every physical requirement, but also is clean-cut and looks the part.

Write and ask to have a representative show how Murex assures smooth deposits and perfect contours, with minimum spatter and undercutting even at extremely high currents.



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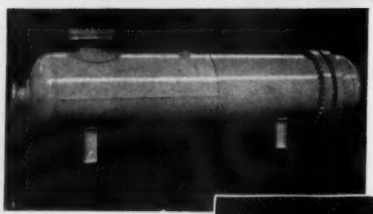
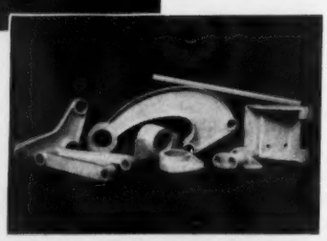


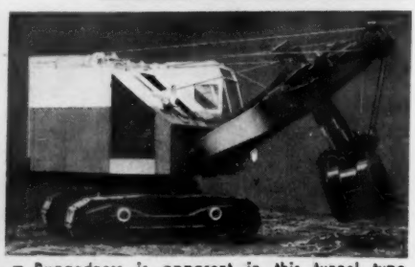
1 This welded shear is strong, rigid, precise—and looks it. Flawless, well-shaped welds play their part. *Photo: Cincinnati Shaper Co., Cincinnati, Ohio.*

2 Murex welded seams in this heat exchanger suggest careful fabrication. *Photo: Struthers-Wells, Warren, Pa.*

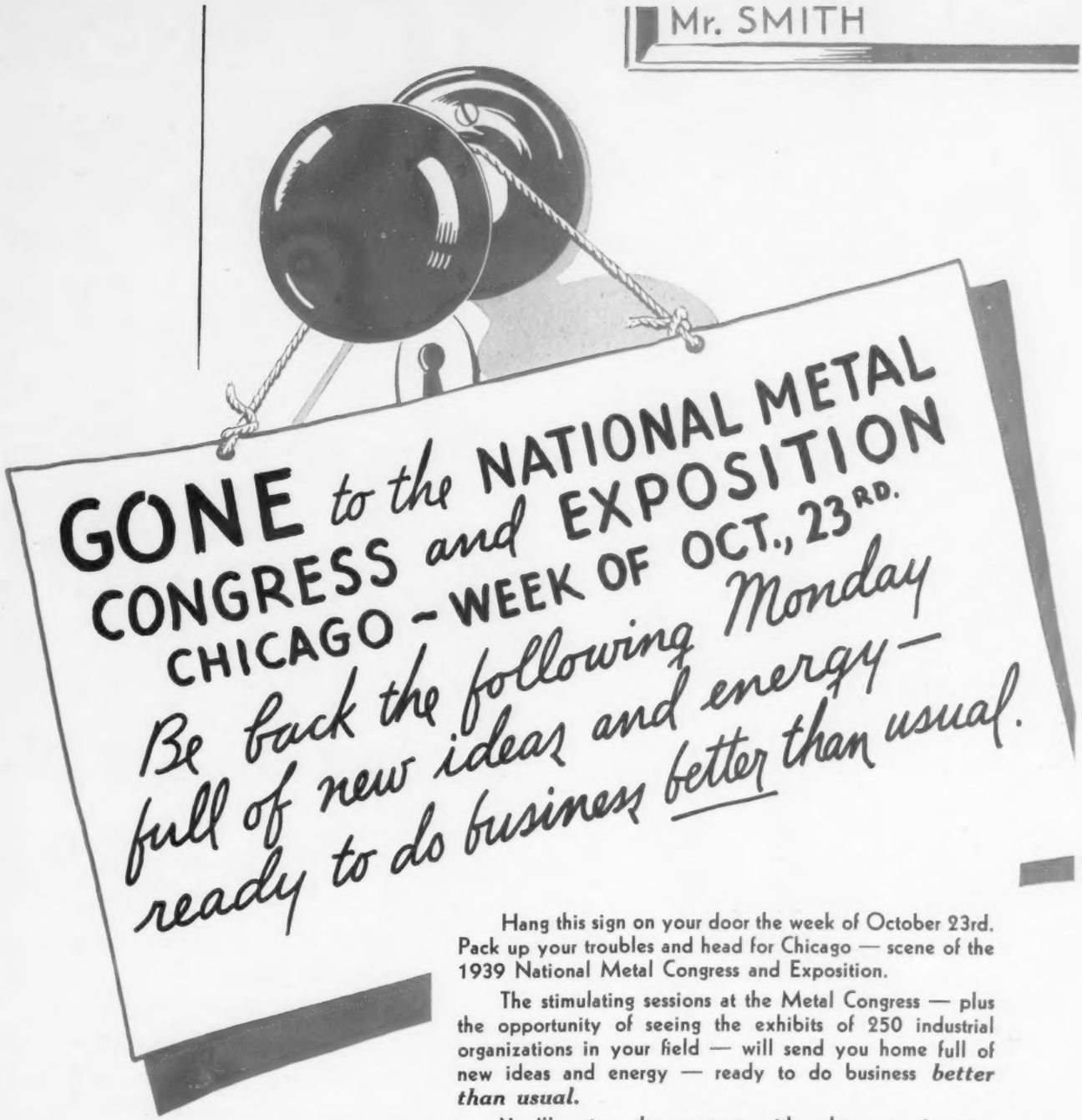


3 Smooth, clean Murex deposits make welded parts neat and trim. *Photo: The Dorr Company, Denver, Colo.*

4 Good proportions of this mill drive suggest strength. Well-formed Murex welds help. *Photo: Farrell-Birmingham Company, Ansonia, Conn.*



5 Ruggedness is apparent in this tunnel type shovel. Welds, too, look sound and strong. *Photo: Marion Steam Shovel Company, Marion, Ohio.*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Be back the following Monday full of new ideas and energy — ready to do business better than usual.

Hang this sign on your door the week of October 23rd. Pack up your troubles and head for Chicago — scene of the 1939 National Metal Congress and Exposition.

The stimulating sessions at the Metal Congress — plus the opportunity of seeing the exhibits of 250 industrial organizations in your field — will send you home full of new ideas and energy — ready to do business ***better than usual.***

You'll enjoy the contacts with other men in your industry, too. They'll be streaming into Chicago from all over the country — 20,000 strong — to attend this great annual event.

You had better make your plans now. For full particulars, contact any of the technical societies listed at the left,— or address W. H. Eisenman, Director, National Metal Congress and Exposition, 7016 Euclid Avenue, Cleveland, Ohio.

Co-operating Societies:
Wire Association;
American Society for Metals;
Institute of Metals Division and Iron and Steel Division of A.I.M.E.;
American Welding Society.

National
METAL CONGRESS and EXPOSITION
INTERNATIONAL AMPHITHEATRE
CHICAGO ..... Oct. 23-27, 1939

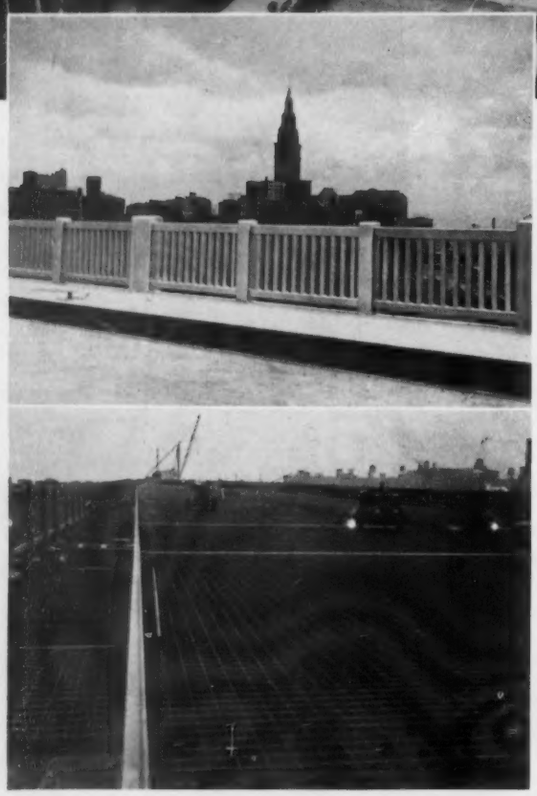

Illustration above shows smooth contours of hand railing fabricated by electric arc welding. Below, all welded steel grid flooring for roadway and sidewalks.

The New Main Street Bridge in Cleveland represents another forward step in the progress of this great City. This mile long elevated highway designed and built under the supervision of the Cuyahoga County Engineer, is now speeding traffic safely and smoothly across the Cuyahoga River Valley 115 feet below. This modern engineering achievement required a total of 10,000 tons of structural material resulting in literally millions of *joints* which had to be made. The problems of construction taxed the ingenuity of the engineers and fabricators in charge who employed the latest approved methods of joining these members to provide an integral highway joining the East and

CHAMPION *Electrodes*

JOINT SERVICE by CHAMPION

West Side of Cleveland, and of sufficient height to permit Ore Boats from the Great Lakes to pass underneath unimpeded so as to reach the ever hungry Steel Mills on the River.

We are proud to announce that over one and one-half million of Champion VICTOR Rivets were used in the fabrication of the structural members, while 32.9 miles of electric welding on the grid deck flooring and railings were fabricated with Champion Welding Electrodes.

Whether your problem be that of Riveting or Electric Welding, we have trained engineers to advise you concerning either process. This is our *joint* service to the Metal Fabricating Industry.

THE CHAMPION RIVET COMPANY
CLEVELAND, OHIO ★ EAST CHICAGO, IND.

Assembling field riveted joints Champion Victor Copper Bearing Steel Rivets were used throughout.

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THREE Norton materials—fused alumina (Alundum), silicon carbide (Crystolon) and fused magnesia make it possible to meet individual conditions—for melting metals, for heat treating metals, for enameling metals. And for research or routine testing there's a complete line of Norton Refractory Laboratory Ware—for ignition, incineration or filtration.

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CONGRESS AND EXPOSITION

SUPPLEMENT
STEEL
OCTOBER 16, 1939

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Twenty-First METAL and

■ SHARP upswing in industrial activity during recent weeks comes as a welcome prelude to the Twenty-first Annual National Metal Congress and Exposition in Chicago, Oct. 23-27. With only two or three exceptions in the past decade, this annual top event in the metals industry has been staged in an atmosphere laden with business discouragements and uncertainty. This year, the air distils a certain confidence even though part of the present recovery must be attributed to unwanted war in Europe.

Chicago is chosen for this important gathering for the fifth time in 21 years, the Windy City having introduced the first congress and show in 1919, others followed in 1926, 1930 and 1935. As in the past, 1939 attendance will include several thousand executives, metallurgists, engineers and technicians from all parts of the United States and Canada. Unlike recent years, unfortunately, few are expected from abroad. The Chicago area is notable for its wide range of industrial and manufacturing activities, being one of the country's leading iron, steel and metalworking centers.

American Society for Metals is principal sponsor and originator of the congress and show. Co-operating technical organizations are the American Welding Society, American Institute of Mining and Metallurgical Engineers and the Wire Association.

The exposition, in International Amphitheatre, will be the largest in recent years. Exhibitors will total about 260, some 30 more than last year in Detroit, and a fourth more than in 1935 in Chicago. The show will occupy the 23,000 square feet in the main arena, and the 57,000 feet afforded by the north and south wings.

Palmer House will be headquarters for American Society for Metals and all morning sessions on the

L CONGRESS
d SHOW

five days will be there. Afternoon sessions will be at the Amphitheatre. A total of 48 papers will be presented in 12 sessions, including 11 at a three-session symposium on age hardening. Two educational courses are scheduled, one on alloy elements in steel, the other on visual examination of steel.

Annual business meeting will take place Wednesday morning, followed by the annual Campbell Memorial lecture by E. S. Davenport, United States Steel Corp., Kearny, N. J. Banquet is Thursday evening.

American Welding Society holds its twentieth annual meeting at the Stevens, activities extending over five days. Fifteen sessions, two running simultaneously during several periods, schedule 56 papers. Miller and Lincoln medal recipients will be named at the opening meeting. Banquet will be Thursday evening and the business session Friday morning.

Institute of Metals and Iron and Steel divisions, American Institute of Mining and Metallurgical Engineers, will stage their fall meetings at the Blackstone, Monday through Wednesday. Program schedules nine sessions with 26 papers about equally divided between the two groups. Tuesday evening is the time for the joint autumn dinner.

Annual meeting of the Wire Association will be at the Congress hotel, four days starting Monday. Six sessions, two of the Steel division, two of the Nonferrous division and two jointly, list 11 papers. One joint session is a symposium on waste acid. Other features are a luncheon Wednesday noon; business meeting in the afternoon at which Dr. S. A. Braley, Pittsburgh Steel Co., will present the first Mordica Memorial lecture; and a dinner in the evening.

RESEARCH in metals has been active the past year; many new developments have been announced, a host of others are promised. With industry tightening its belt for expanding production and bending its energy to reduce costs, these developments will be put into practice in the year ahead.

To keep readers informed on recent accomplishments and to afford a glimpse into the future, STEEL devotes a number of succeeding pages to a review of the past year. Statements of progress in metals, heat treating, welding and wiremaking, contributed by 42 authorities, introduce this section. These are followed by several pages showing pictorially metals in production, treatment, fabrication and use.

■ **Three of the four hotels serving as Metal Congress headquarters are situated on Chicago's Michigan boulevard, shown in the illustration at left, with the view to the north. Illustration at right shows the principal shopping district on State street, looking north from Madison avenue. Photos by Kaufmann & Fabry Co.**

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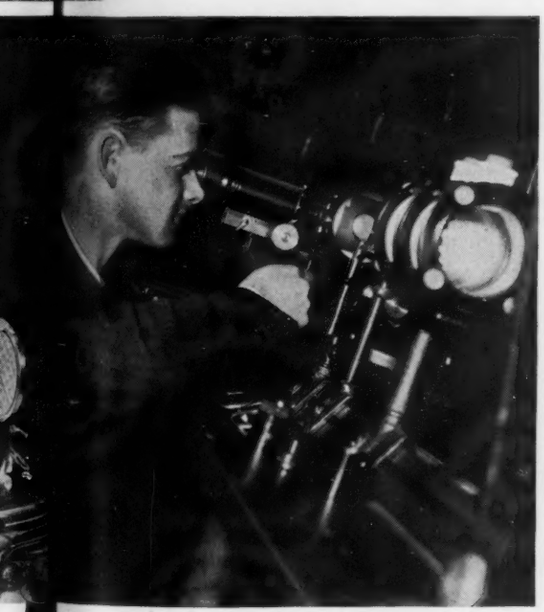

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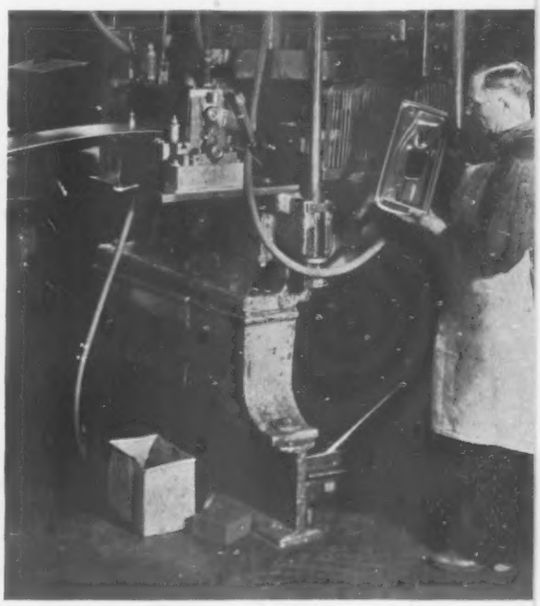

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UNITED STATES STEEL

This Year in

ECONOMIC CONSIDERATIONS SPEED TREND TOWARD LOW-ALLOY STEELS

BY JEROME STRAUSS
Vice President,
Vanadium Corp. of America, Bridgeville, Pa.

■ IMPORTANT changes in application of low-alloy steels have been in progress the past few years and are continuing. The trend is largely the result of economic considerations, but important technical developments have contributed to solution of questions involved and thus made economic objectives attainable.

The combination of refinements in engineering design in articles manufactured by mass production industries, and adoption of results of systematic research in steelmaking, has affected a rapid increase in the consumption of alloy steels of very low total alloying content. Maximum activity in this field, of course, has been in manufacture of automobiles, where improvements in road building and maintenance plus significant changes in the structure of the car have resulted in stressing of forgings, castings, welded assemblies, etc., to stress values appreciably lower than those hitherto employed. Efforts have been made, because of these changes, to travel all the way from so-called full alloy steels of 10 to 20 years ago to plain carbon steels, on the assumption that applied stresses could be sustained adequately by modern improved steels containing no alloying additions.

In many cases, however, this has been impossible, but a satisfactory solution has resulted from use of low alloying contents combined with improved practice in melting, solidification and working. The same alloying elements heretofore used are employed in the new steels, principally nickel, chromium, molybdenum, and vanadium; but there has been an appreciation of what can be accomplished with proper use of percentages of these elements far smaller than have heretofore been thought effective, namely, as little as 0.50 nickel, 0.25 chromium, 0.15 molybdenum, and 0.05 per cent or even less of vanadium. These small additions, suitably combined with each other, and with improved steelmaking practice, and likewise, with judicious additions of the elements manganese and silicon, have resulted in steels competent to serve present needs adequately.

By all of the foregoing, it is not meant to imply that higher alloying contents in low alloy constructional steels are no longer of value. They are still being used, and will continue to be used, in all severely-loaded structures; but in cases where considerable effort and money can be put into engineering development, means often may be found whereby to reduce materials cost.

These refinements in selection and production of constructional steels lead to a requirement for increasingly close similarity of successive heats provided under a single specification. Open-hearth steelmaking has been improved to permit accomplishment of this objective. However, the end sought appears to be relatively easily accomplished in electric furnaces operating with a basic bottom, so that an impetus has been given to construction of very large electric furnaces, namely, of 25 tons capacity or higher. Improvements in design of these electric furnaces that have been beneficial in lowering operating costs have furthered this development. It appears, therefore, that the industry can look forward to an increase in the number of such installations.

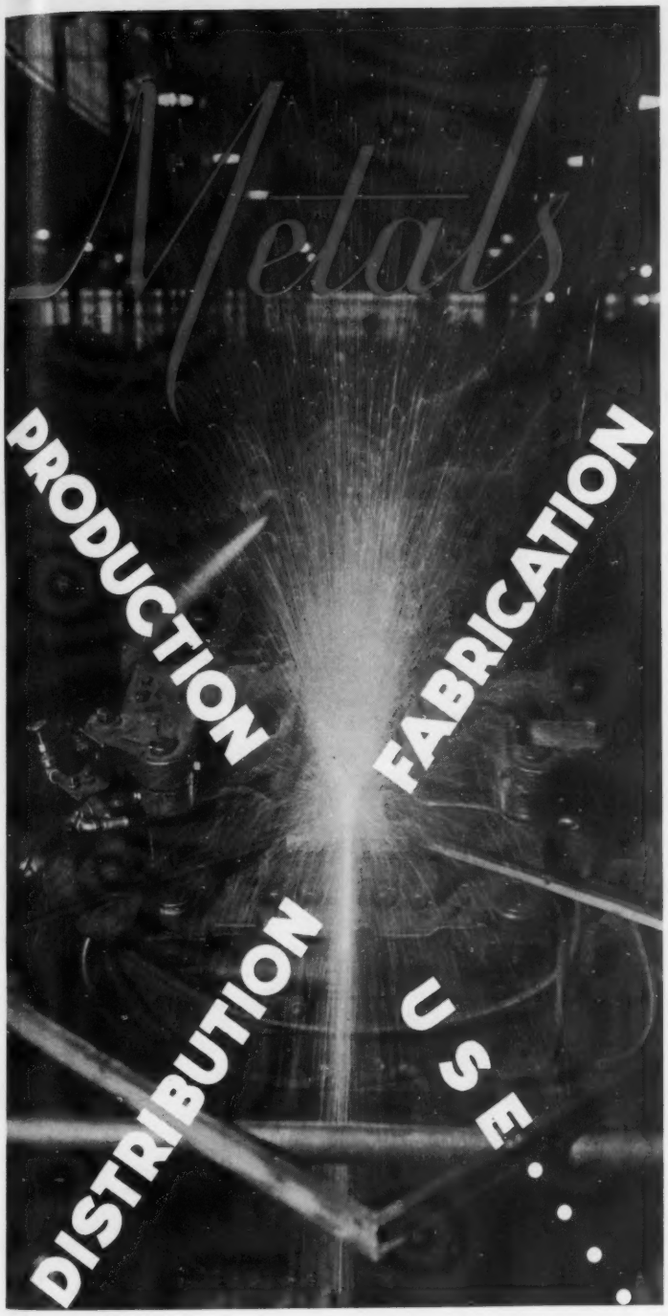
ALLOY ADDITIONS INFLUENCE STEEL PHYSICAL PROPERTIES, GRAIN SIZE

BY W. J. PRIESTLEY
Vice President,
Electro Metallurgical Co., New York

■ EMPHASIS on steel quality has been an important factor influencing trends of alloy uses the past year. Closer control of physicals by use of special combined deoxidizing and scavenging alloys and grain refiners has been of considerable interest. One such alloy containing silicon, vanadium, aluminum and zirconium has proved helpful in producing fine-grained steel of increased impact strength without formation of harmful segregated inclusions.

Much interest has been shown in eliminating age hardening in sheet steel. This can be accomplished by killing the steel, but since other desirable features are obtained from rimmed steels, efforts have been made to improve steels of this type. Several different angles of approach have been used. Partial deoxidation with silico-manganese in the furnace accompanied by decreased amounts of aluminum in molds shows some promise. Use of low-carbon ferromanganese in place of standard ferromanganese has been effective in obtaining lower carbon content, which some claim has a bearing on age hardening characteristics. Nitrogen is considered by others as being the undesirable element which contributes to age hardening. Zirconium, because of its power to eliminate nitrogen or render it less harmful, has been substituted successfully for aluminum.

Zirconium alloys are effective in producing improved



quality in airplane and similar steels which require passing the magnaflux test. This is perhaps due to action of zirconium on sulphur content.

In wrought steels, where extreme cleanliness is desired and where fine grain size is not requisite, calcium-manganese-silicon is being used as sole final deoxidizer. It is apparently inert as far as grain refining action is concerned, and is a powerful cleansing agent. It does not, however, mask effect of grain-refining agents and may therefore be used in conjunction with them in producing finer-grained steels.

In cast steels calcium alloys have proved effective in eliminating intergranular networks of sulphides that so often cause low ductility, woody structures and ragged fractures. Where aluminum alone has been found unsatisfactory for producing desired ductility in steel castings, calcium-silicon or calcium-manganese-silicon with aluminum have given improved results.

Interest has been shown in use of 3 per cent chromium and 0.50 per cent molybdenum in steel forgings and wrought products calling for hardness and strength combined with good impact strength. High chromium content of this steel renders it relatively independent of mass effect. Steel castings of similar alloy content and higher carbon have been used extensively for abrasion resistance for some time.

Application of stainless steels continues to broaden. Increased interest is displayed in use of this metal in aircraft, not only for parts subjected to hot corrosive exhaust gases, such as collector rings, but also for structural parts. Favorable strength-weight ratio of cold-worked stainless in comparison with other metals, combined with its stable properties in wide ranges of service and temperatures, have greatly increased its use.

During the year it was learned that a low-temperature heat treatment given to cold-rolled 18-8 stainless steel improves elastic properties. It raises proportional limit and imparts to the cold-worked material the same modulus of elasticity as that of annealed 18-8; namely, 28-29 million pounds per square inch. The higher proportional limit obtained makes the modulus more readily determinable. This treatment also raises yield stress. It has little effect on ultimate strength and ductility, and no adverse effect on corrosion resistance.

USES OF NICKEL AND ITS ALLOYS ARE EXPANDING OVER WIDE FRONT

BY TECHNICAL STAFF
International Nickel Co. Inc., New York

■ USE OF nickel alloy steels and iron broadened during 1939. Corrosion-resisting steels of the nickel-copper type are finding new applications, being widely adopted for structural members because their high strength-weight ratio makes possible appreciable savings in deadweight. A steel containing 3.5 per cent nickel and susceptible to nitriding, developing under this treatment a tough case capable of withstanding high unit pressure without spalling, is proving superior for certain applications. One important factor in improved performance of the nickel-containing composition is ability to precipitation harden at nitriding temperatures, thus assuring a strong supporting core.

Advantage of flame hardening is being used in wrought and cast nickel steels where high strength and hardness are necessary and where size makes impracticable conventional methods of heat treatment. Nickel-chromium and nickel-molybdenum steels when suitably oil hardened develop in the plastic range high yield strengths with good ductility and toughness. This combination of properties which under excessive load permits only slight deformation before breaking has led to their widespread adoption for shovels and hand tools. In higher carbon ranges, these steels show great promise for plowshares, disks and other agricultural implement parts. In some applications for the paper and petroleum industries, requiring corrosion resistance, tubing made from low-carbon alloys with 5 per cent nickel is proving useful.

Consistency in high mechanical properties, greater toughness and controllable hardness are offered by nickel cast irons. Securable properties have been classified and specifications standardized so that the engineer now can ask for what he needs with assurance that castings will consistently meet requirements. The machine tool industry is one that has already benefited. Extensive modernization in steel rolling mills provided new opportunities for special irons for the reduction rolls as well as for runout and conveyor rolls.

Stainless steel is finding increasing use in airplane construction. Factors working for its acceptance are

development of manufacturing and fabrication techniques.

A tendency to standardize on fewer types is outstanding in brass and bronze practice. Interesting developments are an age hardening bronze containing 5 per cent nickel which after heat treatment has high strength. Addition of 2 per cent nickel to manganese bronze for propellers for high-speed steamers has shown better resistance to cavitation. The year has brought increased use of 70-30 cupro-nickel for salt water lines where resistance to corrosion is the outstanding requirement. Condenser tubes of this alloy in marine condensers are proving their economy over tubes of lower-priced compositions.

In England, and lately in this country, improvements in technique have made it possible to extrude nickel silvers with a nickel content as high as 20 per cent. These will extend scope of architect's design for use of white metals, as he formerly was limited to 13 and 15 per cent nickel-bearing alloys, depending upon intricacy of the shape.

Further expansion in automatic processes and extension in sizes that can be handled are basic developments of the year in nickel plating. Depositing of heavy nickel coatings (cold casting) has been used to build up worn surfaces. These have been produced up to ⅛-inch thick, with Vickers hardness of 400. In contrast, has been use of light coatings (0.0001-inch) on steel, to prevent scaling during annealing. With expanded use of bright plating has come recognition of the relation of porosity to impurities in the bath and a consequent trend to rolled nickel anode.

Rapid progress of radiant-tube type heat treating furnaces in steel mills has increased use of high nickel alloys. In carburizing there has been some displacing of cast boxes with welded sheet construction and development of continuous gas carburizing have increased the requirement for high-nickel, high-chromium alloys for muffles and trays.

Uses of rolled nickel, Monel, Inconel and other high-nickel alloys are being expanded to requirements of new trends, new applications and even new industries. Fields showing greatest promise for increased consumption are: Television, railroads, aircraft, automotive, shipbuilding, industrial, chemical, food and processing. Growing acceptance is found for clad materials.

SEES IMPROVED STEEL PROPERTIES OBTAINED WITH REDUCED ALLOYING

BY H. W. McQUAID
Assistant Chief Metallurgist,
Republic Steel Corp., Cleveland

■ WITH decreased alloys it will be possible to develop in steels properties now thought obtainable only through high alloying. Addition of alloys to date has been primarily to develop the high properties resulting from heat treating. Function of the alloys is to slow down reaction rates so that it is commercially possible to retain structures having maximum combination of ductility and strength. Recent improvements in steelmaking practice indicate that similar effects can be obtained with decreased alloy additions if the diffusion and uniformity of the carbon distribution at the time of quenching can be controlled.

The role of nitrogen in controlling effects of special steel additions, it appears, has been little appreciated. The future will show that the part played by such additions as aluminum, vanadium and titanium, in controlling hardenability is directly connected with their nitrogen reaction and the relative timing of the nitride, carbide, and oxide-forming additions.

Recent developments in protective coatings for sheet, strip, tubing, wire and similar products, indicate that present galvanizing and tin coating practice for providing resistance against weathering and mild corrosion may be threatened seriously by dual coatings electrolytically applied and heat treated. Extensive experimental work has been done with this type coating over the past year, the results indicating that superior protection can be produced at approximately competitive costs.

COLD FORGING PROCESS MAINTAINS CLOSE DIMENSIONAL TOLERANCES

BY A. E. R. PETERKA
Technical Assistant to Vice President,
Lamson & Sessions Co., Cleveland

■ DEVELOPMENTS in the cold forging industry have been progressing far in excess of publicity. More effort has been expended in developing cold forging than in disseminating information regarding results. It is a case of merchandising failing to keep abreast of engineering.

Thousands of parts formerly produced on screw machines or as small hot forgings, and even castings, now are made by cold forging with surprising success. Many such parts are made more economically, faster and stronger than by other methods.

Certain parts, formerly assembled from two or more machined parts, now are produced as one integral unit by cold forging. Hot forged parts, and certain small castings requiring considerable machining are being produced by cold forging without subsequent machining. Some parts are made by cold forging the blank, then following through with subsequent secondary machining operations. Where high-priced alloys, either ferrous or nonferrous, are specified, economy of such manufacture is self evident.

With use of carbide dies and inserts, extremely close dimensional tolerances can be maintained, and a fine surface finish produced in the as-forged part.

A most interesting development is the cold forged nut. This is produced in a five-stage cold forging machine from round wire in coils. The wire is cut off, then upset and extruded in several steps to produce the hexagonal nut blank ready for tapping on an automatic tapper. Most of the metal either drilled or punched out by older methods is extruded outward from the center to form the hexagon shape. This method produces a nut having accurate dimensions and a fine finish because these and other factors are accurately controlled by carefully-made dies. Greater strength results from cold working the metal in that portion which is finally threaded, and, particularly interesting, a nut is produced in which crystal flow approaches the ideal for this type of product.

Any forgeable raw material may be utilized for cold forged nuts. Already demand for nuts from the higher carbon steels, such as S.A.E. 1035, is exceeding manufacturers' production facilities. Ability to procure consistently satisfactory raw material has been one of the serious handicaps in production of the higher carbon cold forged nuts in particular, and other cold forged parts such as aircraft bolts, special upset parts of intricate design, etc.

Raw material used in such manufacture must be free from internal defects. Exceedingly fine seams, cold-shuts or even die marks on the surface of heading wire become highly magnified when the material is upset. Internal defects, such as pipe and slag inclusions, will also show up. The cold forging process eliminates all but sound raw material in all except the most simple upsets.

During the current year one bolt manufacturer has carried as standard stock cap screws made from S.A.E.

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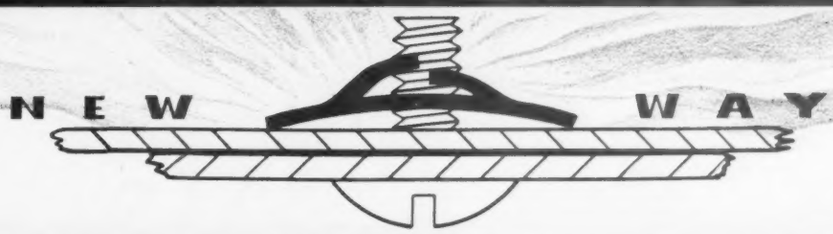
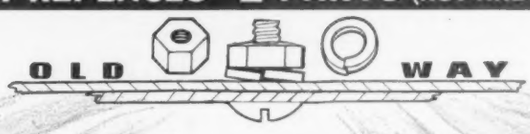


1 SPEED NUT REPLACES 2 PARTS (NUT AND LOCK WASHER)



One SPEED NUT always replaces at least two other parts—threaded nut and lock washer. In some cases a single SPEED NUT has replaced as high as five other parts.

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1035 steel quenched and drawn, having a tensile strength of 150,000 pounds per square inch with a reduction of area of approximately 35 per cent. Such results consistently produced depend on many factors of which high quality steel is certainly among the most important.

In fairness, it must be pointed out that much credit for development in the cold forging industry is due to co-operation of producers of steel and nonferrous heading wire, and to the makers of steels for dies. Without this splendid assistance, the new cold forging machines would be helpless.

EXERTING MORE CARE IN SELECTING ANALYSES OF STEEL FOR FORGING

BY WALDEMAR NAUJOKS
Chief Engineer,
Steel Improvement & Forge Co., Cleveland

■ WHILE the past year has not added many new forging materials for general use to the large variety already available, the qualities offered by the many compositions have gained marked recognition. More care in selection and specification of analyses for specific needs and increased emphasis upon production methods and heat treatment as a means toward obtaining greater efficiency for forged parts has been the general trend. Increased use of alloy structural and engineering steels has been noticeable, the motive being a desire to provide higher strength and overload capacity in high-production equipment.

Corrosion-resisting metals, both ferrous and nonferrous, have been specified for an increasing variety of applications. Some of the more complex experimental stainless metals are moving slowly out of the experimental stage into commercial use. Importance of adequate and closely-controlled heating equipment is receiving greater recognition for processing highly-alloyed and sensitive metals.

Greater use is being made of metallurgical and engineering facilities in production forging plants to assist in selection of suitable forging compositions and treatments, thereby to develop the best properties for specific applications.

TOOL STEEL UNIFORMITY IMPROVED THROUGH CLOSER MELTING CONTROL

BY J. P. GILL
Metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., and Vice President, American Society for Metals

■ METALLURGICAL developments in tool steels continued the past year much in the same manner as during the last few years; that is, the advances have been made up of a number of small developments dealing with nearly all phases, including methods of manufacture, changes in chemical composition and heat treating procedure.

Improvements in manufacturing have been essentially of the type resulting in a more uniform product. Tool steel manufacturers have improved methods of melting to take advantage of cheaper raw materials as well as to prevent loss of expensive alloys in scrap when melting highly alloyed steels, such as high speed steel. Many manufacturers during recent years have installed new heating furnaces for ingots and billets and thus have been able to improve greatly surface conditions and reduce the amount of decarburization usually existing at the surface on hot rolled bars. Users of tool steels have continued to insist on more rigid inspection with result that the deep acid etch test is now universally used and methods of magnetic testing, such as the Magnaflux, have found considerable favor for locating surface defects.

Slight changes continue to be made in composition of some of the older types of tool steel. Many of these changes have involved addition of small amounts of molybdenum to obtain a greater degree of hardenability. Some new compositions of die steel which, while not introduced during the last year, have increased in usage. One of the most outstanding is the type characterized by about 5 per cent chromium and 1 per cent molybdenum and which can be hardened satisfactorily by cooling in still air in comparatively large sections. This steel when made with about 0.30 per cent carbon is quite generally used for hot work and when made with about 1 per cent carbon for cold work.

Several new types of high speed steel have been introduced within the year, one of which has a composition of about 1.25 carbon, 8 molybdenum, 4.50 chromium and 4 per cent vanadium; this steel has shown unusually high resistance to wear. Another contains both tungsten and molybdenum in about equal amounts, usually from 4 to 6 per cent and combined with the usual amounts of chromium and vanadium.

Progress in heat treatment of tool steel continues to be one of surface protection of tools during heating operations. Several new types of salts have been introduced and one new controlled atmosphere furnace using an entirely new type of atmosphere.

The last year witnessed introduction of a number of new compositions of sintered alloys as well as a number of cast nonferrous materials, all of which will displace a greater or lesser amount of tool steel and increases competition in tool materials. Commercial production the past year of metallic manganese, a metal never before commercially obtainable, may have far-reaching effects in the field of nonferrous materials which will compete in the tool steel field.

CAST-TO-SHAPE HIGH SPEED STEELS PROVING WORTH IN METAL CUTTING

BY W. P. WOODSIDE
Vice President, Climax Molybdenum Co., Detroit, and President, American Society for Metals

■ PROGRESS in use of alloys in steels for the automotive industry has been confined largely to minor rearrangements in analyses, although one of two new steels appear promising and may be adopted within the year. A notable increase is observed in use of molybdenum in high speed steels, entirely replacing tungsten in some brands.

A marked improvement has been made in cast-to-shape high speed steels for cutters, reamers, taps and cutting points for drills. By "points" is meant cast-to-shape sections which can be welded to ordinary high speed or other types of steel, depending upon drill size and depth of hole required. This cast product is of a nature next to impossible to forge, but it does give exceedingly longer life at higher speeds than present high speed steels. These remarks do not refer to Stellite or similar types of cast cutting tools whose compositions contain tungsten, molybdenum, vanadium and some titanium, as well as cobalt, which, in some cases, runs as high as 12 per cent. This cast metal is not expected to supplant bar stock for tools, but it is worthy of mention as no doubt it will have its place in the cutting tool industry in the near future.

Further improvement has been made during the year in salt-bath and atmosphere-controlled furnaces for

2 BIG JOBS

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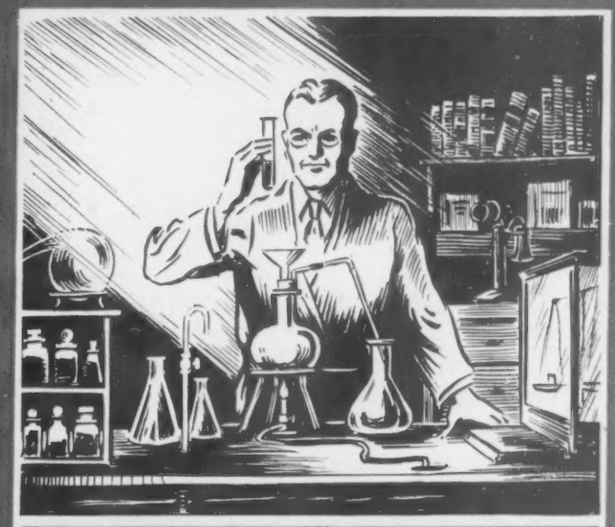

• The modern steel plant has two important obligations to its customers. One is to make steel that meets the exacting demands of industry from day to day. The other is to explore the world of steel metallurgy and discover new and better steel-making methods that will be advantageous to industries using steel.

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WISCONSIN STEEL

This Year in METALS

heat treating high speed and other types of tool steels. These furnaces are solving some of the troubles previously laid to composition of the material as well as to skill of the heat treater.

PRODUCTION OF PURE MANGANESE IS DEVELOPMENT TO BE WATCHED

BY A. ALLAN BATES
Manager, Chemical and Metallurgical Division, Research Laboratories, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

■ A YEAR AGO the writer called attention to the announcement by Dr. R. S. Dean of the Bureau of Mines of a newly-projected, commercially-feasible process for production of pure manganese and commented that this development gave reason for some hope on the part of metallurgists that a new member may yet be added to the group of some half dozen metals which are basic in our systems of industrial alloys. Potential significance of such an addition would be difficult to exaggerate and it is yet much too early to appraise future importance of "pure" manganese. Dean and his colleagues continued their work during the past year and their progress strengthens the writer's opinion of 1938 that here is a development to be watched.

Manganese-base alloys with copper, nickel, chromium, iron, and other metals, have been preliminarily studied and have exhibited interesting ranges of strength, ductility, workability, damping capacity, electrical resistance, magnetic permeability, hardenability, stainlessness, etc. Meanwhile during 1939 a plant for the commercial production of pure manganese has been put into operation. No doubt the "bugs" which infest any new process will be encountered but in so stressful a period as the present American metallurgists may well wish success to any native venture into production of so strategic a metal as manganese.

A somewhat more orthodox field in which notable progress is being made is that of brazing—particularly furnace brazing. Here development of improved brazing alloys and of suitable atmosphere-controlled furnaces have paved the way. Investigations of phenomena involved in wetting of surfaces by molten metals indicate the importance of surface condition during brazing. Therefrom arises the necessity for properly designed furnaces and correctly balanced atmospheres.

In the electrical, automotive and similar industries, where the problem of permanently assembling intricate, accurately-fitted parts is encountered frequently, use of the furnace brazing process is growing at a great pace. It has even been predicted that it may become a distinct field of engineering activity in the same sense as has electric arc welding.

BERYLLIUM-COBALT-COPPER ALLOYS AVAILABLE IN STRIP AND WIRE FORM

BY R. H. HARRINGTON
Research Laboratory,
General Electric Co., Schenectady, N. Y.

■ A REVIEW of nonferrous metals and alloys should take into account Trodaloy 1, an alloy of 0.4 beryllium, 2.6 cobalt and 97 per cent copper, which combines an elastic limit of 50,000-60,000 pounds per square inch and electrical conductivity of 50 per cent with a recrystallization temperature of 500 degrees Cent. Trodaloy 7, an alloy of 0.1 beryllium, 0.4 chromium and 99.5 per cent copper, combines an elastic limit (accuracy of 0.00001) of 35,000-45,000 pounds per square inch and an electrical conductivity of 75 per cent with a recrystallization temperature of 500 degrees Cent. While previously available as castings, forgings, rod and plate, the forms of strip and wire for springs only recently have become available through special fabrication methods, especially heat treatment in atmospheres free from O_2, H_2O and CO_2.

Precipitation hardening characteristics of aluminum-copper-iron alloys are now better known. The nickel-tungsten equilibrium system has recently been defined. High-purity binary and ternary aluminum-copper alloys are subject to continuing investigation. Copper-cobalt and copper-iron alloys have been studied for age-hardening effects. Development of nickel-base and precious alloys continues with new results to be published soon. Beneficial effects of additions of zirconium to nickel-silicon bronzes have been announced. The copper-silicon alloys have been subjected to further study.

Rolled magnesium alloys are becoming more and more important. Just what values these will be in applications must await publication and discussion of specific information during the National Metal congress. Of outstanding importance is rapid development and application of magnesium alloy castings, particularly die castings. If the present European war continues long, interest in alloyed zinc sheet is bound to increase greatly.

Recent interest has been high and future developments are certain to come from controlled use of internal strain in conjunction with several variations of precipitation hardening heat treatments to develop alloy properties not otherwise available.

New compositions are continually being developed, combining high strength properties with high electrical conductivity for applications in resistance welding electrodes, electrical contacts, and electrical conducting springs. Interest in these fields probably will continue for some time to come.

PRODUCE HEAVIER COILS OF STRIP BRASS, BRONZE TO MEET DEMAND

BY H. P. CROFT
Chief Metallurgist,
Chase Brass & Copper Co., Cleveland

■ RECENT demand for long coils of strip brass and bronze which will enable fabricators to operate presses and roll forming machines with less idle time has resulted in production of heavier coils by the following methods:

1. Extrusion of rectangular sections on a rod press followed by cold rolling into strip form. Maximum weight obtainable is between 60 and 100 pounds per inch width.
2. Butt welding of sheet bars on the finish or ready to finish gage. Maximum weight obtainable in this manner is limited solely by capacity of handling equipment. At present, satisfactory welding equipment is only in the development stage.
3. Casting of heavier sheet bars. Here maximum finish weight varies considerably with the alloy, width, gage, and producer but coils of 40 to 60 pounds per inch of width may be possible in the near future. At present, standard for the industry is 30 pounds per inch of width. Introduction of heavier coils has necessitated heavier handling equipment but also permits economical use of such recently developed machines as 4-high mills and tension devices for maintaining both front and back pull on the metal while rolling. Three high mills also are being used. Center roll may be either idling or driven. Conveyor systems are not only economical but almost essential for transporting the metal from one operation to another and often for

SAVE IN MANY WAYS

ANACONDA FREE CUTTING RODS

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2. Sharp threads, clean knurls and close tolerances on machined diameters are held for longer continuous runs. This means less down time per machine.
3. Because of the natural attractive color of Anaconda Copper, Brass, Bronze and Nickel Silver Free Cutting Rods, parts are often used without applied finishes.
4. When lacquer, enamel or plated finishes are required, they are applied quickly and adhere more tenaciously on a base that can't rust.
5. Copper-alloy scrap has a relatively high salvage value: The net cost advantage of using free cutting brass or bronze develops rapidly as the percentage of scrap increases.
6. Considering the higher production, economies in tools, power and overhead, plus a more accurate and attractive finished product, it can truly be said that Anaconda Free Cutting Rods offer the opportunity to save in many ways.

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N.B. For uniform composition, temper and free cutting characteristics, specify Anaconda Rods. They're made by The American Brass Company

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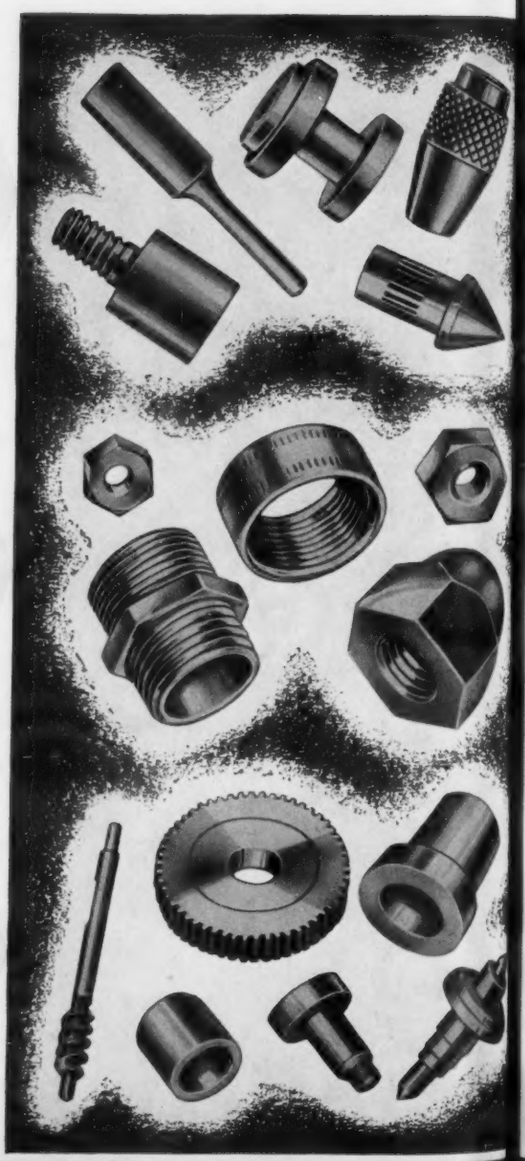
Offers an Anaconda Rod for Every Screw Machine Job

FREE CUTTING BRASS—Time-tried for many years, Anaconda Free Cutting Brass Rods have known superiorities. They are recognized by many leading manufacturers as the best all-around material for the manufacture of screw machine products. Their uniform free cutting characteristics permit ready duplication of cutting feeds and speeds known to be satisfactory from previous job records. But it must be remembered that the analysis of a metal does not necessarily determine its free cutting characteristics. Much depends on the accurate control of its processing. When special physical properties are required, such as additional ductility to permit a spinning or cold forming operation after machining, either the temper, the alloy, or both, can be adjusted to suit the requirements. Anaconda Free Cutting Brass Rods are available in round, square, hexagon, octagon, decagon, rectangular, oval, half-oval, and other standard and special shapes.

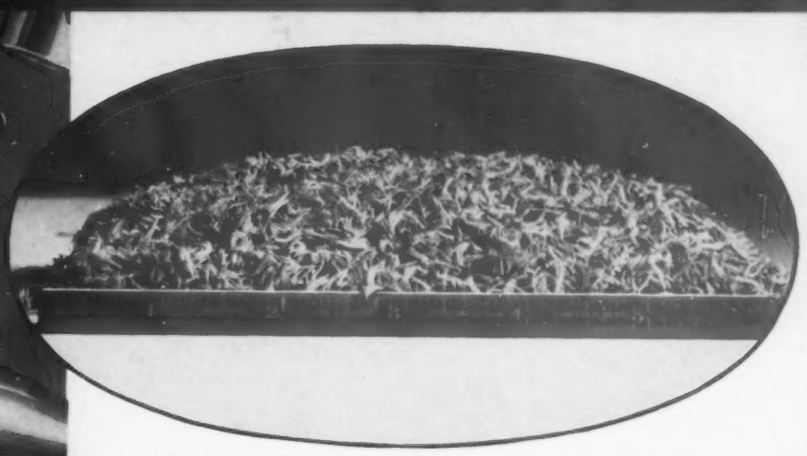
LEADED COPPER—Anaconda Leaded Copper 946 possesses excellent machining properties. This alloy cuts freely, producing small chips that will not foul cutting tools. The tensile strength of this rod is very nearly that of hard drawn copper. Elongation is slightly reduced. Minimum electrical conductivity is 95% I.A.C.S. at 20°C. Anaconda Leaded Copper 946 is being satisfactorily used for many screw machine parts, including soldering iron points, gas welding tips, and similar products. These rods are available in rounds, squares, hexagons, rectangles, and in special drawn shapes in mill lengths suitable for screw machine production.



EVERDUR 1012—Everdur 1012 is a modification of The American Brass Company's standard Copper-Silicon Alloy. It is free cutting and was developed especially for the production of screw machine parts requiring the strength and toughness of mild steel, but which must also have the corrosion resistance of copper. The machineability of this rod is approximately 60% that of free cutting brass and permits a rate of production in excess of that possible with cold rolled Bessemer steel screw stock. Free cutting Everdur 1012 Rod is furnished in the form of rounds, squares, hexagons and octagons in standard mill lengths.

SPECIAL FREE CUTTING PHOSPHOR BRONZE 610—This alloy can be machined almost as readily as yellow brass and is being extensively used for the production of small bearings, bushings, valve and pump parts, gears and pinions, and for many other screw machine products where a relatively high resistance to wear is an essential quality. These rods are available in round, square, hexagonal and other conventional shapes; also in toothed pinion and ratchet sections, and practically all irregular cross-sections that can be obtained in other non-ferrous metals. The American Brass Company produces several other grades of Anaconda Phosphor Bronze Rods, which, while not quite so readily machineable as the "Special" 610 Alloy, nevertheless possess good machining properties.

Anaconda COPPER · BRASS



There's a profit story in chips, too!

Small chips such as these from Anaconda Free Cutting Brass are readily washed away by the coolant or cutting compound. This means less breakage and a longer accurate life for drills, taps, reamers, form tools and chasers. Remember, too, that compact turnings are easy to handle and have a relatively high scrap value.

HARDWARE BRONZE AND LEADED COMMERCIAL BRONZE—Anaconda Hardware Bronze was developed to provide a free cutting alloy to match the color of red brass so generally used for hardware. Similarly, Anaconda Leaded Commercial Bronze was developed to match the color of commercial bronze frequently employed for architectural metal work. Both of these alloys closely approach free cutting brass in machineability. They are available in conventional forms and also in special drawn shapes. Being particularly resistant to corrosion cracking, these alloys are ideal for exposed products where the higher strength of Everdur is not required.

FREE CUTTING NICKEL SILVER—Nickel Silver Alloys take a high polish and possess good corrosion resisting qualities. They are strong, tough, and durable, yet sufficiently ductile to permit cold forming and spinning operations with almost the same facility as brass. Anaconda Free Cutting Nickel Silver Rods are produced in 10%, 12%, and 18% standard alloys composed of copper, nickel and zinc, and include a small percentage of lead to provide the machineability required for screw machine work. Other rods containing higher percentages of nickel but without lead are also available. All are produced in the form of rounds, squares, hexagons, octagons, and special cold drawn and rolled shapes.

. . . AND OTHER ANACONDA RODS FOR GENERAL FABRICATION AND ENGINEERING PURPOSES

In addition to Free Cutting Rods, The American Brass Company produces a broad range of copper and copper-alloy rods for general fabrication, many of which are also suitable for engineering purposes. These rods are available up to 3½" diameter, and larger, depending on composition and length, and are produced by all commercial methods—extrusion, hot rolling, cold rolling and drawing —or by a combination of these operations.

The Anaconda Rods listed at right are supplied in conventional and special shapes. While most of these rods do not contain lead, many of them are used for screw machine products.

Copper	Nickel Silver (5% to 30%)
Commercial Bronze (95% and 90%)	Manganese Bronze
Red Brass (85% and 80%)	Everdur*
Yellow Brass	Avialite*
Tobin Bronze*	Ambraloy*
Naval Brass	Tempaloy*
Ambrac Metal*	Forging Brass
Phosphor Bronze	Muntz Metal
	Architectural Bronze

*Trade-Marks registered in U. S. Pat. Off.

S BRONZE & NICKEL SILVER RODS

Anaconda SPECIAL SHAPES IN ROD FORM *SAVE* THEIR METAL COST MANY TIMES OVER

BY eliminating expensive milling and other machining operations, Anaconda Special Shapes in long mill lengths are a short cut to a finished product in many branches of industry. Shapes such as pinions, cams, and irregular sections of practically all descriptions are produced by either cold drawing or extruding, depending on the alloy. The finished form is commercially constant in cross section and possesses a higher tensile strength and denser grain structure than sand castings.

Anaconda Special Shapes are available in copper, brass, bronze and some nickel silver and phosphor bronze alloys in rod form suitable for use in screw machines, turret lathes and in other types of equipment. They are readily machined and have smooth surfaces which may be easily polished or plated.

This Booklet *tells how Anaconda Rods cut the costs on many screw machine products.* If you make, sell, buy, or use screw machine parts of any metal you will want this booklet. It gives complete details on Anaconda Free Cutting Rods and their relation to tool life, power consumption and many other factors that help determine the ultimate cost of screw machine parts. Write for Publication B-14.

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OFFICES AND AGENCIES—Atlanta, Ga. • Boston, Mass. • Buffalo, N. Y. • Chicago, Ill. • Cincinnati, Ohio • Cleveland, Ohio Denver, Colo. • Detroit, Mich. • Houston, Texas • Kenosha, Wis. • Los Angeles, Calif. • Milwaukee, Wis. • Newark, N. J. New York, N. Y. • Philadelphia, Pa. • Pittsburgh, Pa. • Providence, R. I. • Rochester, N. Y. • St. Louis, Mo. San Francisco, Calif. • Seattle, Wash. • Syracuse, N. Y. • Washington, D. C. • Waterbury, Conn.

WAREHOUSES: Chicago, Ill. • Cleveland, Ohio • Milwaukee, Wis. • Philadelphia, Pa. • Providence, R. I. The American Brass Company of Texas, Houston, Texas

IN CANADA: Anaconda American Brass Limited. Manufacturing Plant and General Office, New Toronto, Ontario Montreal Office: 939 Dominion Square Building

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carrying it through annealing, pickling, and quenching units.

Large coils have complicated the annealing without increasing annealing cycles with the result that more attention is being paid to convection heating by rapid circulation of hot gases either by internal or external fans. Use of these simplify burner construction and control in addition to reducing outlet temperature variation to a figure comparable to that of instrument accuracy. Bright annealing of copper and clean annealing of brass are being effected in most of the fabricators' plants.

Insofar as new products are concerned, admiralty tubes, containing either antimony, arsenic, or phosphorus, which were introduced last year, are finding wide-spread use in oil fields and other installations where dezincification of admiralty tubing was previously encountered. They are not only resistant to such waters but oppose corrosion from sulphur more successfully than higher copper alloys. Any of these elements, when present in small amounts in admiralty or other high brass tubing, apparently is successful in prohibiting dezincification.

Many age-hardening copper alloys although possessing excellent physical properties have had disadvantages of high mixture or fabricating costs, high temperatures for heat treatment, some susceptibility to stress corrosion cracking as well as difficulties of cleaning after hot operations. These have been eliminated in a new series of patented age-hardening alloys which contain nickel and phosphorus in approximately atomic proportions. Age hardening is effected by the precipitation of nickel phosphide in a simple low temperature heat treating operation. These alloys combine unusual physical properties and high electrical and thermal conductivities with ease of hot and cold fabrication.

Discovery of the beneficial effect of tellurium on machinability of copper alloys in 1937 by Lawson and Burghoff, has been followed by the introduction of several commercial alloys employing this element. Free-turning copper, containing 1 per cent lead has been used in the past but has always been somewhat difficult to fabricate and suscepticle to lead segregation. These troubles have apparently been overcome by substitution of tellurium for lead with no loss in machinability. Further addition of nickel in small amounts improves physical properties with a consequent proportional loss in conductivity.

Analytical work in producers' laboratories has been speeded by adoption of the spectrograph as a routine analytical instrument, thereby reducing the amount of comparatively slow chemical work.

RESEARCH IS IMPROVING ALUMINUM BRONZE FOR SPECIFIC PURPOSES

BY C. J. ZAISER
President,
Ampco Metal Inc., Milwaukee

■ PRIME objective of the nonferrous metal industry continues to be the improvement of physical and mechanical characteristics of metals, both by development and refinement, to meet increasingly exacting industrial demands.

In the copper-base alloy field, aluminum bronze producers have effected further improvements in their product through addition of fourth and fifth alloying agents to the basic copper-aluminum-iron components, and through exploration of heat treatment effects. Selective physical property improvement, of course, is an always to be desired achievement. Present-day research is going beyond that, however, by improving wear resistance, lowering frictional characteristics, raising corrosion resistance, and making the alloys more serviceable in specific directions. Success is attending efforts to raise maximum temperature service limits, to improve workability, and to ease machining difficulties on the harder alloys.

The same situation applies to other nonferrous alloys. Development is proceeding in all directions, spurred by the driving demands of users, many of whom have their own specific and pressing problems. Contrary to the sometimes-expressed belief that the ultimate in alloy development is being approached, it seems likely that a refining period holding untold possibilities lies ahead.

ALLOYS WITH BERYLLIUM COMMAND INTEREST; PRICE OF METAL DROPS

BY J. R. TOWNSEND
Materials Standards Engineer,
Bell Telephone Laboratories Inc., New York

■ OUTSTANDING developments in nonferrous metallurgy the past year have not involved announcements of entirely new metals with unique properties. Developments have been less dramatic but nevertheless valuable, indicating improvement in quality of metals and in manufacturing processes.

Developments in use of beryllium have been interesting. Price of the metal has been reduced from $23 to $15 per pound. Discovery of a method for producing ductile beryllium has not been announced as yet. A new alloy of interest contains 98 per cent nickel and 2 per cent beryllium, and is said to have a tensile strength of 260,000 to 300,000 pounds per square inch, and to maintain its chemical properties at temperatures as high as 400 degrees Cent. Hardenable alloys in which cobalt and chromium, respectively, are used to replace part of the beryllium in copper-base alloys have been announced.

Magnesium-base die casting alloys now are available. Given protective treatments, these are sufficiently corrosion resistant that they can be used for parts where light weight is important. Cold-rolled magnesium and aluminum alloys may be spot welded at minimum loss in mechanical properties. Larger surface treatment baths and heat treating furnaces have made it possible to protect large parts and also fabricated structures.

Lead with a calcium alloy agent has seen rather extensive use for storage battery plates. These alloys may be heat treated and offer considerable advantage over other lead alloys because of their hardness and stiffness. They do not self-discharge and have a low sulphation rate. Also, when the battery is used in enclosed areas, it will not generate dangerous stibine gas since antimony is not utilized as a hardener.

In the field of zinc die castings there has been considerable improvement in casting methods, die design, improved methods of cooling, increased pressures and spectrographic control of alloy composition. Use of vacuum in the die cavity has decreased castings porosity. Result of these improvements is denser castings with higher ductility and smoother surfaces which require fewer finishing operations.

Announcement of an essentially pure aluminum promises more extensive use of this corrosion-resistant metal. Protection of aluminum and its alloys by cladding and anodic treatment has been extended to the building trades and to the automotive field, particularly for truck bodies.

The art of die pressing and extrusion of tubes, containers and many other parts of aluminum has been extensively developed. Interest is manifested in a combination process whereby aluminum and zinc die

castings serve as inserts over which plastics are injection molded for protection and decorative effects. Current applications are automobile steering wheels, door handles, and the like.

A new bronze alloy produced by careful degasification consists of 14 per cent tin, balance copper, and shows 100,000 pounds tensile strength with 20 per cent elongation. This alloy may be worked hot or cold. Another copper alloy contains 5 per cent aluminum, balance copper. It is being used for trolley wire and has a conductivity of 17 per cent and a tensile strength of 150,000 to 160,000 pounds per square inch.

A newcomer in the field of powdered metals and contact metals is made by pressing and sintering mixtures of tungsten, carbon, molybdenum, copper and silver. Silver also is coming into rather wide use for electrical contacts.

SHIP HULL CONSTRUCTION MAY BE NEW FIELD OF USE FOR ALUMINUM

BY L. W. KEMPF
Research Metallurgist,
Aluminum Co. of America, Cleveland

■ USE of aluminum is expanding at a rate greater than that of most other metals despite the fact that fields of utilization do not change markedly from year to year. A new application may go unnoticed for years until tonnage reaches appreciable proportions.

The transportation industry continues increasingly weight-conscious. To the ten so-called all-aluminum trains in operation soon will be added two additional eight-car trains; a new steam-electric locomotive unit employs considerable aluminum; and a new subway train utilizes aluminum as the principal metal.

Perhaps pointing the way to a new application in transportation is investigation of applicability of aluminum to hull construction of ocean-going ships. After three years at sea on a mooring off Newport News, Va., a 13-foot, 3800-pound model of the center section of a 100-foot patrol boat built of aluminum plates, members and sections, appears in excellent condition and no reason is indicated why, aluminum, if properly applied, should not be used in hull construction. It has long been used for superstructure and interiors.

Specific alloys are gradually improved year by year and new ones added only infrequently. By far the largest tonnage of wrought aluminum is in the form of the so-called common alloys, 2S (commercially pure aluminum); and 3S (1.25 per cent manganese). For castings, largest tonnages are in alloys containing 6-8 per cent copper and 0.5 to 4 or 5 per cent silicon.

The strong, heat-treated, wrought aluminum alloys most generally utilized fall into two classes: (1) Aluminum-magnesium-silicide type; and (2) aluminum-copper-magnesium type. Of the two, aluminum-magnesium-silicide alloys, A51S, 53S, 61S, offer the widest range of workability in tempers available and highest degree of corrosive resistance. Alloys of aluminum-copper-magnesium type, 14S, 17S, 24S, 25S, on the other hand, give highest mechanical properties.

Other alloys are utilized which do not fall in these classifications; for example, 52S (2.5 magnesium, 0.25 chromium). This alloy is not susceptible to heat treatment and offers mechanical properties about midway between those of common alloys and heat treated alloys. Other special alloys include one, 56S, containing about 5 per cent magnesium, utilized primarily as fine wire for wire cloth and hookless fasteners. This alloy is not only strong, but has excellent corrosion resistance. Another special alloy, 11S (5 copper, 0.5 lead, 0.5 bismuth) is utilized primarily for screw machine rod, because of its free-cutting.

In the castings field, heat treated strong alloys fall in three groups: (1) Aluminum-copper, 122, 195; (2) aluminum-silicon-magnesium, 132, 355, 356; (3) aluminum-magnesium, 220. Castings of these generally are utilized with both, or either, solution and precipitation heat treatments. There are also materials falling outside this simplified classification. The 214 alloy (4 magnesium) finds utility particularly because of high corrosion resistance and characteristic white color; 43 alloy (5 silicon) is used widely for its excellent casting properties.

In the die casting industry, a new alloy, 218, containing about 8 per cent magnesium is finding wide favor because of high mechanical properties and excellent finishing characteristics.

An even more specialized aluminum alloy application was announced recently as result of long investigation both here and abroad indicating applicability of certain tin-containing alloys for bearing purposes.

Also responsible for large uses of aluminum is application to the product of special process procedures. Thus the electrolytic oxide finish designated Alumilite continues to be applied to millions of pounds of aluminum because of its superior resistance to corrosion and abrasion and improved appearance it gives the metal. Alclad sheet is used in large quantities in aircraft.

DEEP DRAWING OF MAGNESIUM SHEET OPENS NEW FIELD FOR THIS METAL

BY A. W. WINSTON
Director, Metallurgical Research,
Dow Chemical Co., Midland, Mich.

■ THIS year has brought many new developments in fabrication and use of magnesium, a metal which was first produced commercially only about 25 years ago. As industry's lightest structural metal, magnesium alloys are called upon to reduce weight and thus increase pay load, reduce power consumption, or improve efficiency in other ways.

Sand castings of magnesium alloy are finding increasing application on aircraft engines and accessories. Likewise, for reciprocating parts of stationary machinery lighter weight construction results in higher operating efficiency. The year has seen an increase in number of fabricators producing sand castings, making them available in all consuming districts.

The aircraft industry has become interested in magnesium alloy die castings for cover plates, landing wheels, stabilizing instrument parts, and other articles. One automobile manufacturer is using up to 6000 such die castings a day in generator and starting motor parts. Demand for magnesium die castings also has increased for many miscellaneous parts, including wire spools, portable equipment, conveyor parts, cameras, goggles, and a variety of others.

Extruded magnesium alloys in sizes larger than ever before produced have been manufactured during the year. Large safety blocks for presses, formerly of cast construction, now are made more economically and stronger by extrusion. Extruded tubing with 7-inch outside diameter is being manufactured in 20-foot length for use in newly developed methods of oil and gas well production.

Improvements in forming technique and quality of magnesium sheet constitute major developments. Result is that deep-drawn aircraft wheel fairings and brake covers, tank heads, and similar articles are now in regular production. This development has caused industry, particularly the aircraft branches, to investigate new applications.

Magnesium alloys should be given paint protection, although it is not always necessary. Lasting adhesion

Ajax-Northrup Induction Furnace Heating Steel Bars for 3 Inch Shells—This Ajax-Northrup Furnace in the Artillery Division of Frankford Arsenal is used to heat bars of steel ready for producing two 3 inch shells from each bar. In the left-hand furnace is a bar that has been heated for forging, while in the foreground is a bar that has already been shaped on one end.

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AT THE METAL SHOW

operating exhibits will suggest how improvements in quality, speed of production and costs can be made in your plant.

A rotating ring of steel will be heated to a red heat by the invisible electrothermic currents.

Two small steel rods will be heated alternately to show the loss and regaining of magnetism through heating and cooling. A diorama of small melting furnaces from 2 ounces up to 9,000 lbs., will be on exhibit and Ajax Engineers will be on hand to discuss the remarkable strides made in the application of both heating and melting during the past few years.

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of paint coats is assured by use of chemical treatments which provide a suitable base for the primer. During the year, two new treatments, Dow Nos. 7 and 8, have been developed for this purpose. These processes surpass previous treatments and are approved by governmental agencies for exacting aircraft service. Another chemical treatment, Dow No. 6, provides attractively dyed coatings that possess excellent protective qualities and good abrasion resistance. A recently developed primer offers possibility of painting untreated magnesium alloy surfaces for ordinary outdoor exposure where it is not desirable or possible to first apply a chemical treatment.

MODERN ZINC ALLOYS EXTENDING APPLICATIONS FOR DIE CASTINGS

BY R. E. KELLERS
Market Development Division,
New Jersey Zinc Co., New York

■ TO CHRONICLE advancements in the die casting industry in the past year is difficult. The scope of application has widened so rapidly, and the reasons for this expansion are so diverse, that it is doubtful whether any individual or single group within the industry properly can judge why the die casting process has reached its present status.

It is a recognized fact, however, that modern zinc alloys have played a major role in die casting development. Some brief comment on these alloys and their application, therefore, should be of assistance in establishing some of the reasons for current die casting progress.

Actually, zinc die casting alloys are no different than they were a year ago—their physical characteristics remain unchanged. But design engineers have learned more about zinc alloy die castings and how and where to put their many qualities to work. The result has been countless numbers of new applications that would have been considered impossible a year ago—a handle for a tension wrench in which strength is of primary importance; a 30-inch lamp column in which appearance and economy of production govern the choice of material; and a loud speaker for a public address system in which extreme accuracy is required. These are typical instances of the penetration of die castings into new fields.

This progress, however, cannot be credited entirely to the design engineers. As in each of the past ten years, 1939 has witnessed important advancements in die casting technique. With new applications came the need for greater flexibility in casting practice. That the country's commercial die casters have successfully met the new problems is evidenced by the many unusual zinc alloy die castings that were produced in 1939—and will be produced in 1940.

DIE CASTINGS ARE NOW RESHAPED BY NEW COLD FORMING PROCESS

BY CHARLES PACK
President,
Doehler Die Casting Co., Todelo, O.

■ VARIOUS metalworking processes are assumed to be competitive. Die castings, for example, are produced in direct competition with metal stampings, screw machine products, forgings, sand castings, etc. Quite often, process of manufacture is determined by ultimate cost.

It is interesting to point out, however, that good engineering practice does not limit itself to any one method, but utilizes advantages of all. Thus, we may have a die casting that represents the skill and technique of the die casting process but which has been subsequently formed, blanked or forged to supplement deficiencies or limitations of the casting process.

This end is accomplished in a process for cold forming die castings developed recently by the writer's company. The process is applicable to production of ball-shaped articles, such as door knobs, hollow handles, wheels, and the like, which cannot be cored in the die casting process. By borrowing sheet metal stamping technique, it is possible to form the casting into desired shape, which combines the desirable features of both the die casting and the stamping.

Holes difficult to core in the die casting process are also often introduced by blanking, a procedure also borrowed from the stamping process. Frequently, a boss or other projection would cause complications in a die cast subject. The forging or upsetting method is often resorted to, in such instances. The die caster has long recognized the utility and economy of the screw machine product and does not hesitate to apply it to his product. Design of die cast parts, with one or more screw machine parts cast-in as inserts, is common practice.

Thus, it is evident that whereas the various metalworking processes are competitive with each other, their best features can be combined and utilized to form a composite product representing the most economical production method. Although die castings essentially are chilled pressure castings, modern types in reality are often a combination of casting, stamping, screw machine product, etc.

GET BETTER AVERAGE PERFORMANCE FROM IMPROVED CEMENTED CARBIDES

BY K. R. BEARDSLEE
General Sales Manager,
Carboloy Co. Inc., Detroit

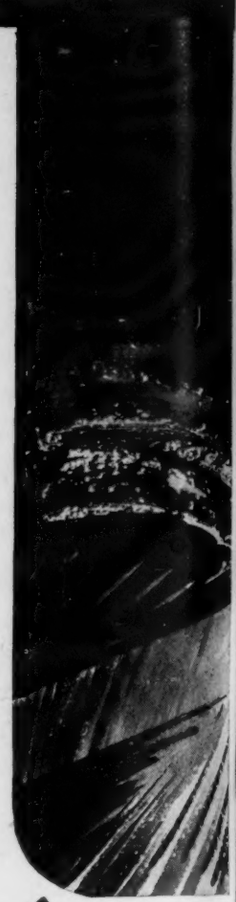
■ PAST YEAR witnessed numerous trends of interest to users of cemented carbides in the metalworking industry. From a metallurgical standpoint, improvements in technique of processing cemented carbides resulted in production of more uniform metal with a resultant improvement in average performance.

In use of these materials as cutting tools, several noticeable trends developed. Whereas in the past, carbides have been considered special-purpose principally on quantity production runs, or difficult-to-machine applications, today they are finding wide utilization as general-purpose tool materials. This tends to eliminate costly, time-consuming testing of a multitude of carbide grades to determine which will give maximum performance on a given job. Users are directing their attention toward selection of general-purpose grades that will give best average performance on the greatest possible number of applications. In many instances it has been found that two grades—one for cutting steel; the other for cast iron, nonferrous metals and nonmetallics—produce excellent average results.

This trend embodies the most important step taken toward broader use of carbides since their introduction, because it drastically reduces investment required to tool up for carbide use. Under this procedure, the former large stock of diversified grades is eliminated, and an economical stock of two or possibly three general-use grades now serve the purpose.

Also contributing to broader use of carbide tools has been the simplification of the grinding problem through improvement of existing types of diamond wheels and development of new types. Grinding still

What's Behind... the



WHEN you see a Linde Service Operator in your plant — perhaps behind a lighted blowpipe — you know he's bringing practical assistance. Helping do a new or difficult job — showing how to save a costly shutdown — or demonstrating a more effective way of using Linde products. A big part of his job is to help control your process costs.

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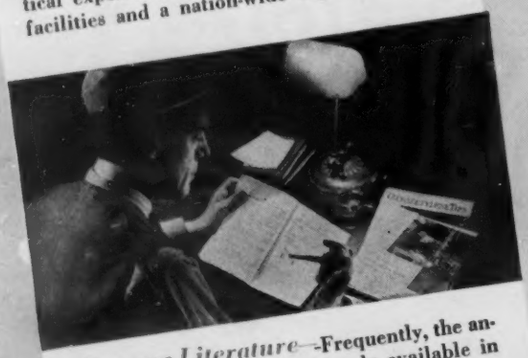
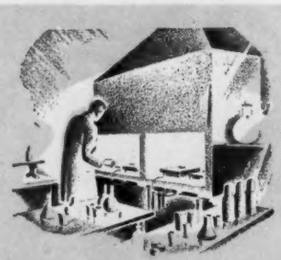


Process Literature—Frequently, the answers to problems are already available in the form of printed literature. *Oxy-Acetylene Tips*, the Linde monthly magazine, is full of information on "how it is done."

Man-Power—Linde service is built on adequate, co-ordinated man-power in the field—on the teamwork of process engineers, service operators, and development men.



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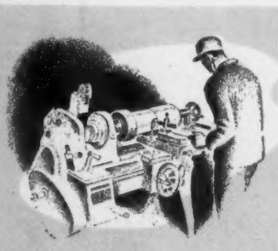
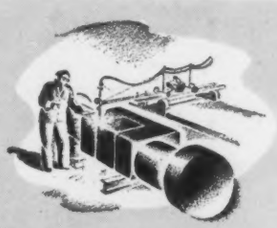


Manufacturing—All Linde apparatus is manufactured in up-to-date plants that use good materials, precision methods, rigid inspection, and thorough testing procedures.



Apparatus—Linde has blowpipes for every purpose—cutting and welding machines — acetylene generators — flame-hardening equipment — a complete line for every need.

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Learn more about the Unionmelt welding process and other new processes and products developed by Linde, at Exhibit Areas L302 and M301, National Metal Exposition, International Amphitheatre, Chicago, October 23-27, 1939.

is an important factor in successful use of carbides but practice is being steadily simplified.

In the drawing and sizing die field, many wire mills have replaced obsolete equipment with new, continuous machines. These machines run at speeds which in most cases would be economically impractical were carbide dies not available. Thus, carbide dies continue to play an increasingly important part in reduction in cost and increase in productive capacity of the wire, bar and tube industry. The past year also has seen improvement in forged casings used for carbide dies. The net result of this has been in many instances a tendency toward increasing the maximum hole size possible in a given die.

Latent possibilities of cemented carbides in the field of wear-resistant, noncutting applications are being steadily developed and there have been a number of installations this year which in volume of carbide consumed is comparable to consumption of several thousand cutting tools or drawing dies. For one application alone more than 125,000 pieces have been produced. This and other applications of similarly large volume further substantiate growing belief that use of cemented carbides as a wear-resistant medium on localized areas subject to excessive abrasion or corrosion may eventually exceed many times its more common use today as a cutting metal.

EXPECTS USE OF FERROUS POWDERS WILL EXCEED THAT OF NONFERROUS

BY CHARLES HARDY
President, Hardy Metallurgical Co., New York

■ A NUMBER of articles on ferrous metal powders and particularly sponge iron have been published recently. Some of these dealt with production of sponge iron for other than powder metallurgical uses, but only powder metallurgy will be considered here. Unfortunately, progress in the ferrous field has not equaled that of powders in the nonferrous field, the reason being mainly two-fold.

First. Ferrous products command much lower prices than, for instance, products based on copper. These lower prices necessitate production of iron, steel alloy. nickel or chromium powders at prices which are out of proportion to the prices at which the metals themselves are available.

Second. Powder metallurgy demands an entirely different purity of metal than does the melting operation. Impurities such as silica, alumina, magnesia, etc., are eliminated in a smelting operation—these impurities enter the slag. In powder metallurgy, unless the impurities are eliminated before forming the compact they will stay with the compact as there is no way to remove them in course of operation. Result—low physical characteristics of the iron, steel or alloy produced by powder metallurgy.

To obtain on the one hand a powder cheap enough to compare within reason with the price for iron or steel and at the same time pure enough to create comparative high physical characteristics is a problem which is the subject of intensive investigation. Carbonyl iron, carbonyl nickel, electrolytic iron, hydrogen-reduced iron, all available in commercial quantities, are used to a considerable extent where quality of the finished product is the sole aim and price is no object. The volume, however, although appreciable, is not what it should be, or would be if iron of sufficient purity could be produced at a reasonable price.

Powder metallurgy, however, makes more demands than purity and price. The powder must be sufficiently ductile to allow compression; it must be of a grain size which will permit the particles to compact and to adhere without a binder. Some of the irons previously mentioned are so finely divided that, being flour-like, adhesion between particles is not obtainable unless a binder is employed. Of whatever nature the binder, it introduces problems that should be avoided.

With a number of minds now intensively directed to production of iron and other ferrous metal and alloy powders, it is anticipated that before long use of these powders will far exceed use of metal powders in the nonferrous field.

UNITED STATES INDUSTRIES USING 1 TON OF POWDERED IRON PER DAY

BY JULIUS S. MADARAS
Consulting Engineer, Detroit

■ POWDER metallurgy is one of those few industries in which the art of using the material has developed ahead of the art of manufacturing the material itself. In many school laboratories and industries extensive experiments are being carried on with powdered metals—making gears, bearings and other articles which are expensive to cast or machine to correct size and shape but are easy to make by compressing powdered metal into a die. Furthermore, many of the articles compressed from powdered metals possess desirable qualities not obtained when the articles are made in the customary way.

And yet, when the amount of metal used in powder metallurgy is compared with the amount of the same metal used for melting stock, it is surprising that with all this research and seemingly ready market, powder metallurgy as an industry is only in its infancy; rather, it is in an embryonic stage. This becomes more evident when one considers yearly production in all countries of powdered iron suitable for compressed parts is probably less than the annual world production of gold. Survey shows that in the United States, for instance, only about a ton of powdered iron per day is used in all industries.

It is appropriate, therefore, to ask whether powder metallurgy is merely an industrial and research curiosity or whether it is the beginning of a promising manufacturing art? If the market is ready to absorb immediately large quantities of articles compressed from powdered metals why is not the supply available and what will release the flood of those articles to fill the need? Analysis of the problem involved in these questions is instructive.

The simple answer seems to be the lack of supply of suitable powdered iron at a cost the market can bear. Principal powdered metals used are copper, chromium, nickel and iron. All these metals must be of rather high purity, in addition to possessing special characteristics of size and surface of particles and free flowing quality.

Pure fine metal powder of proper flowing characteristics is produced most readily by an electrolytic method from rather pure base metal. The electrolytic process itself adds several cents, in general 6 to 8 cents per pound, to the base price of the metal. Powdered copper, and especially powdered nickel and chromium, can easily carry this added cost, partly because the base price is already high and price of the product is high whether it is made of melted stock or from powder, and partly because in most cases the powders are used in small quantities as alloys mixed with iron. Consequently, they can carry the higher price.

The story is different with powdered iron. It is powdered iron for which there is an extensive market

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whether in form of pure iron, powdered steel, or a mixture with other metals such as nickel and chromium. Strangely enough, the electrolytic process for producing powdered iron seems to involve higher cost than for copper or other alloys. While electrolytic powdered iron proves to be highly satisfactory, the cost of its production makes its use prohibitive except for exceptional cases.

Powdered iron is being produced now by low-temperature reduction methods, both carbonaceous and gaseous reduction, at a much lower cost, but quality often is not satisfactory for general use. Some powdered iron produced by low-temperature reduction is used at present in small quantities, but it is necessary to mix in a considerable amount of copper to serve as a "binder," which increases cost and reduces strength of the product.

However, it is perfectly possible to produce by the low-temperature reduction method powdered iron to meet price and quality requirements. Such processes, indeed, are being developed on an industrial scale and should be able to produce for the market in the near future.

DEMAND FOR IRON POWDER AWAITS REALIZATION OF ECONOMIC VALUE

BY R. H. MONTGOMERY
Irnite Corp., Detroit

■ A SUFFICIENT supply of powdered sponge iron is and has been available to care for needs of United States' manufacturers for a long time to come. If there is any uncertainty as to the supply, arrangements could be made to store future requirements in local warehouses. Therefore, progress does not seem a question of raw material.

Several attempts have been made in America to make sponge iron "the continuous way." Why not the old "Chinese" or "Swedish" way until demand compels some other? While most American attempts have been on paper or in laboratory or pilot plant form, still the late William H. Smith had perseverance to build a commercial size plant, operate it and turn out several hundred tons of sponge iron. But he could not sell the product: there was no demand. Had any one actually given Smith an order for around 30 tons a day continuous production of powdered or briquetted sponge iron at even 5 cents a pound, he would have furnished it. One cannot produce sponge iron economically in pound lots or small tonnage, and until someone provides a market, what is the use talking about making sponge iron?

Since inception of the idea four years ago of making pressed powdered iron pieces there has been much talk but little action. Today there are four items in production or partial production in America with a tonnage consumption of far less than 2 tons a day. As soon as industry learns the economic value of powdered sponge iron, as soon as it is learned how to make less costly dies, as soon as the facts on heat treating and alloying are understood, and the million and one determinations made on the new product before it will be acceptable to the trade, then and only then, can there be a demand for raw material.

As soon as tonnage is provided, there are at least two sources available at low prices, but it appears that day is far distant. In the meantime there is an abundance of powdered sponge iron available at a price permitting manufacturers to increase their profits per turnover on thousands of items.

However, as this writer sees the market and is cognizant of the iron manufacturing end, particularly as far as heavy pressures are concerned, it is his opinion that eventually a large part of the small gray iron and malleable iron castings, wrought iron, forgings, brass castings, die castings, some plastics, as well as certain tubes, bars and sheets, where large duplication of parts is possible, may be made of powdered sponge iron. This is but another step in the evolution of industry and is basically sound.

PROBLEM OF PRODUCING LOW-COST IRON POWDER BEGGING SOLUTION

BY ALBERT T. FELLOWS
Research Chemist,
Metals Disintegrating Co. Inc., Elizabeth, N. J.

■ ALTHOUGH advances have been made in powder metallurgy as a whole during the past year, greatest interest appears to be in the ferrous field. Much has been said about the imminence of great developments in ferrous powder metallurgy, a prospect in which there is general agreement.

A Review of powder metallurgy a year ago by A. J. Langhammer (STEEL, Oct. 10, 1938, p. 138) touched upon the future of iron powder. A. H. Allen's account of the present situation (STEEL, April 10, 1939, p. 43) afforded glimpses into the long and oft-repeated history of "cheap" sponge iron, a history largely characterized by many repetitions of essentially the same experiments, usually with the same results. The latter article is recommended to all who believe that sponge iron of a suitable quality "can be produced at what sounds like a ridiculously low figure."

Gregory J. Comstock (*Iron Age*, June 1, 1939, p. 40) takes exception to the premise that American iron is essential to development of an American ferrous powder metallurgy. His remarks suggest that because of past dependence largely on Swedish sponge iron, American industry should or will continue to be so dependent. Perhaps the unfortunate events in Europe which have moved with such rapidity since Sept. 1 may bring about American independence from foreign iron powders, similarly to the independence achieved by American dyestuffs and chemicals as a result of the 1914-18 war.

Present sources of iron powder are somewhat limited. American produced iron presently available is limited to electrolytic iron, understood to be produced in relatively small quantity and offered at prices which preclude large scale usage. A little reduced iron and possibly some sponge may also be available. Carbonyl iron made in Germany has always been of very high price. Swedish sponge irons remain. Finally, although it is known the matter is receiving urgent attention in several quarters, volume American production of an iron of acceptable quality and at a price suitable for large scale powder metallurgical application is still to become an actuality.

Allen stressed that low price can only accompany large volume and large volume can only follow a low price. Strongly intrenched financial interests thus are needed who can afford the necessary risks as suitable plant will entail high investment costs. Furthermore, as a result of the great volume of scientific and patent literature on the subject, it might be questioned whether technical problems of the preparation of low-cost powdered iron have in fact been mastered.

We agree with those who write optimistically on the future of ferrous powder metallurgy, but we align ourselves with those interjecting a note of caution as to when and how this future will be realized. The future,

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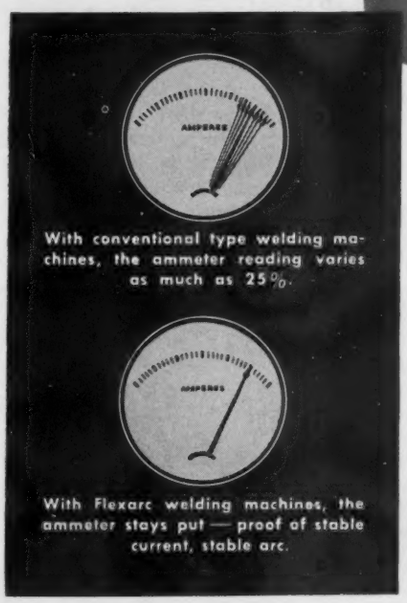
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it is felt, will be with an American process, working on American raw materials, and probably characterized by American volume production methods.

DEVELOPMENTS IN ATMOSPHERES SPUR INTEREST IN CHEAPER STEELS

BY G. T. WILLIAMS
Metallurgist, Testing and Research Laboratories, Deere & Co., Moline, Ill.

■ IT IS not news that use of controlled atmospheres in all types of heat treating operations is continually increasing. The wide variety of gas analyses which can be produced by the many available preparation units covers practically every requirement. One phase of use of protective atmospheres for hardening, however, has been little discussed, that is, the possibility of using cheaper steels.

For most applications a steel of high (oil) hardenability is required; if severe scaling or even a thin but tightly adherent scale occurs, higher alloy contents may be required to give the steel the necessary "kick" to overcome this interference with the quench. On the other hand, if a nonscaling, nondecarburizing atmosphere is used in the hardening operation, equivalent results often may be achieved with much more economical steels, such as plain carbon with moderate increase in manganese or with small additions of chromium of molybdenum. Thus alloy extras may be reduced, or even a carbon practice steel utilized if the quenching medium is given a better opportunity to do its work unimpeded by scale. Developments in controlled atmospheres therefore are contributing to interest in more economical steels.

Another important factor is current interest in hardenability; many investigations into this phase of steel behavior are beginning to show the way to making of alloy steels with controlled, uniform hardenability. To date, the knowledge is empirical, as with grain size control; even after 20 years' study no one seems to know today what fundamental action causes variations in hardenability with uniform chemistry, but control is becoming feasible in spite of this ignorance. We must remember the sharp differences of opinion between the Al and Al_2O_3 schools of thought on mechanism of grain size control to reassure ourselves that satisfactory results are to be had even in the absence of know-why.

Mounting data indicate the usefulness and efficacy of Grainal deoxidation in promoting maximum hardenability with excellent physical properties, but there is no explanation yet as to why the combination of reagents is so much more effective than any sequence of the same individually applied.

FURNACES FOR GAS CARBURIZING ELIMINATE USE OF ALLOY MUFFLES

BY E. F. DAVIS
Metallurgist, Warner Gear Division, Borg-Warner Corp., Muncie, Ind.

■ MUCH progress has been shown in developing high-manganese steels with excellent hardness, high torsional values, and at the same time, ample toughness for many parts where formerly alloy steel was requisite. In some automobiles, employment of alloy steels has been decreased materially. Fine-grained high-manganese steels corresponding to S.A.E. X1340 will harden up to 514 brinell without becoming excessively brittle.

The gas carburizing process still is making further inroads into box carburizing. Several furnaces are being erected in which use of an alloy muffle is eliminated. Future furnace construction will be without the muffle, which has been the largest expense item in gas carburizing. One furnace in an automotive plant has operated nearly 2 years without a muffle.

W. A. Darrah, Continental Industrial Engineers, has advanced a new theory of the action of gas carburizing which is an important contribution to knowledge on this subject, particularly prevention of soot deposition and possibility of iron and nickel carbonyl serving as carriers or intermediate agents in producing carbon in a form it can be assimilated into the steel.

Employment of radiant tube heating is increasing, particularly in furnaces using atmospheres to prevent oxidation. This type of heating is proving quite successful.

A decided improvement in quality of salt baths for hardening is observed. Neutral baths do not show the tendency to decarburize which formerly existed. Liquid carburizing baths also have been much simplified to the single bath salt. Rusting tendency of work carburized in liquid baths has been almost eliminated.

Although few new steels have been developed during the year, yet steel manufacturing practice has shown a decided improvement due to better control of processes.

GAINING A BETTER UNDERSTANDING OF USE OF FURNACE ATMOSPHERES

BY W. P. EDDY JR.
Metallurgist and Service Engineer, General Motors Truck & Coach Division, Pontiac, Mich.

■ NO HEAT treating process, unknown a year ago, has attained commercial significance. However, during the past year a few well-defined developments and trends in practice have been apparent.

Taming of atmospheres has become almost a universal accomplishment, and is just about taken for granted in certain heat treating operations, at least as far as new equipment is concerned. Although determinations of proper atmosphere compositions for specific jobs still are largely empirical, much progress has been made toward elimination of cut-and-try procedure.

In the majority of cases, object of control is to maintain atmospheres inert to the metals treated. But another and increasingly important phase of atmosphere control is use of special atmospheres to increase carbon or nitrogen content near surfaces of steel parts—the reincarnation, on a higher plane, of old gas carburizing —or ethereal cyaniding. This type of atmosphere utilization is well adapted to addition of thin cases to medium-carbon alloy steel gears or other parts which should be wear-resistant. In some high-production shops such atmospheres are displacing cyanides as surface hardening media.

However, in general, it appears that low-production shops and those handling a variety of parts are continuing to use liquid baths for light cases. Recent rapid increase in number of case-hardening bath mixtures apparently has stopped. Most present mixtures do good work, but it will not be surprising if a few fall by the wayside because of lack of profitable business.

In deep case-hardening, gas carburizing also has made considerable headway, though by far the greater portion of this class of work still is carburized in solid compound. Different procedures of carburizing, reheating and quenching are used by different manufacturers, except for automotive axle gears, nearly all

of which are now quenched directly from carburizing containers and temperatures.

On the heels of this direct-quenching parade have come noteworthy developments in low-alloy steels suitable for such treatment. Direct quench, in fact, is not generally applicable to higher alloy steels formerly used for highly stressed case-hardened parts, because of excessive austenite retained near surfaces by drastic high-temperature quench.

In the field of liquid baths, a surprising revival of interest in neutral salt baths is under way. Salt baths were a live issue in the 1920's, but later, possibly because of many misapplications, lost favor. We now hear of new baths for all temperature ranges. Most new baths are believed to be fundamentally similar, though improved, to the mixtures sold 15 years ago. Unquestionably so-called inert baths have wide usefulness; whether they are coming back to stay may depend on the degree of judiciousness with which they are merchandised.

Hot-quenching in molten salt or lead, as a substitute for or improvement over conventional quenching and tempering, may be coming; but to date it is, from the commercial viewpoint, barely visible over the horizon.

Short-cycle malleablizing unquestionably has arrived. On the other hand, pearlitic heat treated malleable irons seem to be making rather slow headway.

Activity in the field of heat treatment is, as always, intense, because metal manufacturers, heat treating equipment builders, and fabricators of parts all are vitally interested. It is a safe bet that future developments will overshadow those of the past.

NOW HARDENING MORE SENSITIVE STEELS WITH OXYACETYLENE TORCH

BY R. L. ROLF
Metallurgical Engineer,
Lakeside Steel Improvement Co., Cleveland

■ PROGRESS in heat treating the past year has been mostly in refinement of technique, new applications, and a more comprehensive knowledge of the subject, rather than startling new developments.

In flame hardening, torch design, machines, methods and technique have been improved to the point where more sensitive steels may be hardened readily on a production basis. Internal diameters, both large and small, are successfully treated, permitting engineers to take advantage of hardened bores.

The progressive spinning method is rapidly replacing the old, progressive rotary method with its spiral paths, for with the latest development, rounds of undetermined diameters and lengths may be hardened uniformly and without the characteristic soft areas which accompanied the older method. Already engineers have taken advantage of this procedure, such as in manufacture of rolls where special alloy steels combined with expensive hardening and straightening operations have been replaced by cheaper materials, flame hardened to produce the same hard surface, but straightening has been either reduced to a minimum or entirely eliminated.

Formerly flame hardening was closely allied with regular shapes, such as gear teeth, sheaves, track wheels, etc., but today, contour hardening, or the hardening of irregular shapes has permitted this process to make vast inroads in hardening of tools and dies for the stamping industry. This method permits dies to be surface hardened to maximum at points of greatest wear, thus tending toward the reduction or elimination of erosion and giving longer working life.

Many major economics of construction may be achieved by the proper application of flame hardening. Operating costs may be reduced by longer life, distortion may be held to a minimum or eliminated, and in many instances cheaper materials may be substituted for more expensive alloys.

FABRICATORS SHOULD CARRY SHARE OF COST IN WELDING RESEARCH

BY G. F. JENKS
First Vice President, American Welding Society, and
Chairman, Industrial Research Division of
Welding Research Committee, Engineering Foundation

■ A GLANCE at programs for the National Metal congress discloses interest of the metal industry in gaining a better understanding of fundamental structure and properties of materials. This desire for information is not idle curiosity nor the search for knowledge for knowledge sake. It is a search for knowledge to make structures safe and to save dollars.

In no industry is there greater need for fundamental knowledge than in the welding industry. The executive may sit in his office and the stockholder look at his dividend check and conclude that all is well in an industry which has expanded so rapidly. The engineer, however, is concerned with all the technical problems involved in economical, efficient and safe construction, and would have exact information where he must now guess by rule or trust to his intuition.

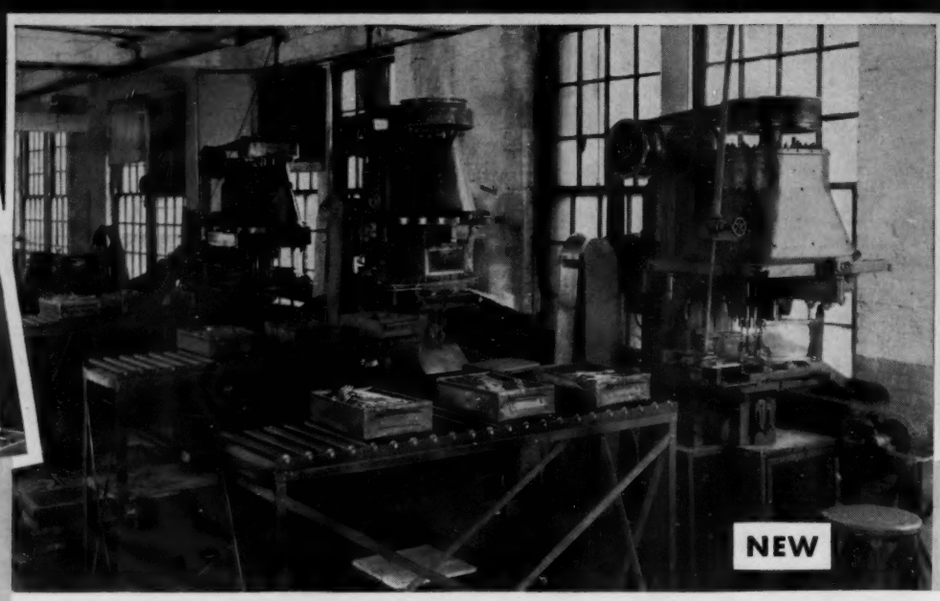
The situation is complicated by the competitive situation which has brought about introduction of a large number of brands of carbon and alloy steels for which various claims are made as to properties and weldability. In spite of all available information concerning these materials, there is an amazing lack of knowledge as to their properties, weldability and behavior in service. It is true that the only criterion is service use—that industry must proceed on the basis of its current knowledge and profit by mistakes and failures.

There is available to industry, however, an increasingly effective research organization. Of course, the major effort of research organizations is devoted to solving problems of corporations which employ them. Our metal industry, however, is increasingly conscious of the problems of the fabricator and the consumer and is making real contributions to their solution. Fabricators are organized in no such large units and lack research organization. As a result, they look to the metal producer to solve their technical problems.

Fabricators are normally short-sighted in unloading their metal problems upon the producer and using the sales engineer as principal technical adviser. Of course, the limited engineering personnel of the fabricator's plant can't know everything and must use available sources of information.

In this country and abroad co-operative research organizations have been formed in part as a remedy for such situations. They constitute organizations upon which fabricators and consumers can unload part of their technical problems and obtain authoritative information. Such organizations are willingly financed in part by the larger units of industry and their technical personnel is made available for the common good. Difficulty in such organization is to reach the fabricator and consumer. The savings of co-operative research is for the ultimate benefit of these two groups. The fabricator is perhaps the more important because he has the moral responsibility of protecting the ultimate consumer of his product.

To secure maximum assistance from producers, fabricators must assist in carrying a part of the financial burden and participate in research committee activities. The fabricator of the welding industry apparently does



By shifting from lineshafts to individual Westinghouse drives on these countersinkers, McKinney has stepped up production, reduced handling costs, improved working conditions remarkably.

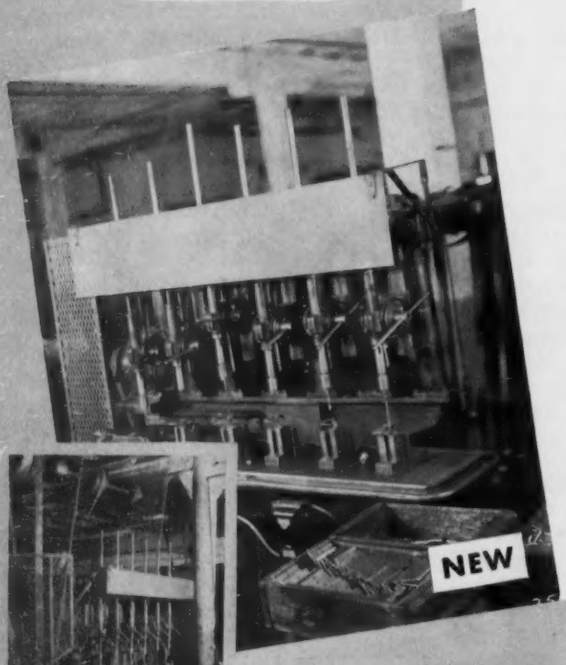
MODERN DRIVES PAY IN METAL-WORKING PLANT

McKINNEY MANUFACTURING COMPANY REPLACES OLD LINESHAFTS WITH DIRECT DRIVES—SPEEDS AND IMPROVES PRODUCTION—CUTS HANDLING AND POWER COSTS

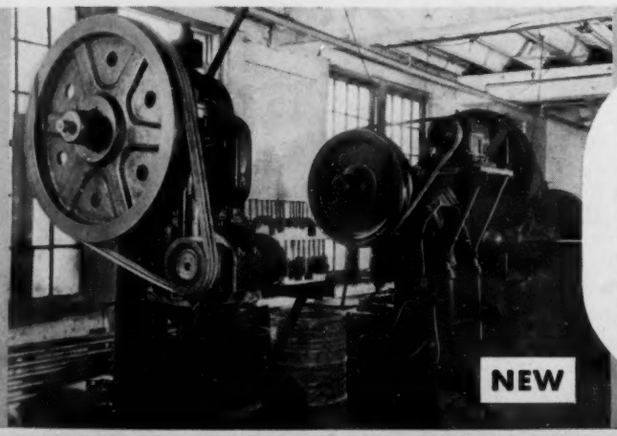
Modernizing with Westinghouse individual drives is increasing the "profit margin" in this large metal-working plant. Low power factor, caused by unbalanced loads, has been corrected. Production has jumped because machines can be located with more flexibility for "straight line" production. Handling costs have been reduced. Better lighting has improved quality of work. Absence of belts, less vibration and noise, have combined to make working conditions safer and more satisfactory.

Perhaps Westinghouse can help you improve your "profit margin." Call in or write the Westinghouse electrical wholesaler, industrial agent, or district office in your city.

Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa.



Multiple drill presses are now driven by individual 3 hp Westinghouse motors — thus providing more efficient production methods, as well as more comfort and safety for operators.



Unbalanced loads caused low power factor when a 40 hp motor drove equipment. Individual gearmotors increased production and flexibility, decreased power costs.

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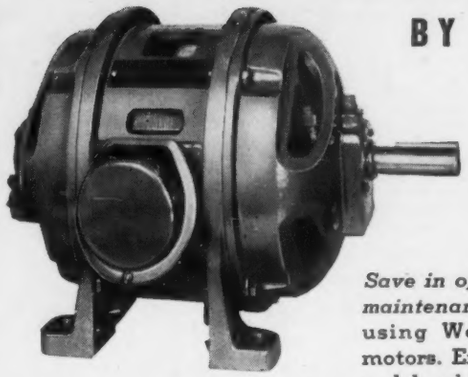
STEP UP
"PROFIT MARGINS" *WITH MODERN EQUIPMENT*

GET MORE POWER PER DOLLAR BY MATCHING MOTORS TO THE JOB



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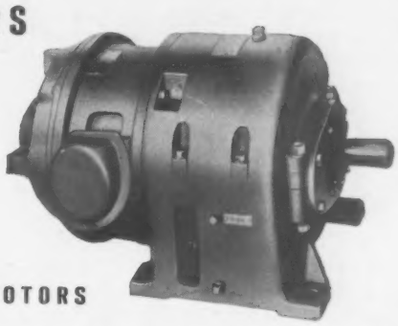
Save in operating and maintenance costs by using Westinghouse motors. Extra strength and durability in sealed sleeve bearings, one-piece frame and Tuffernell insulation.



GEARMOTORS

Save in first cost and operating cost with Westinghouse gearmotors that give you efficiency of high speed motors at exactly the required speed for the driven machine. Save power wasted in obsolete lineshafts and belts.

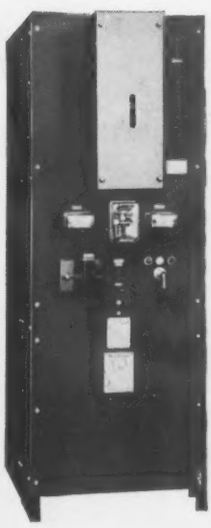
SAVE ON POWER BILLS AND OPERATING COSTS

CAPACITORS

Improve power factor and cut power costs by installing Westinghouse capacitors . . . reduce line drop and effect better line regulation . . . reduce circuit losses and decrease transformer losses.

COMBINATION LINESTARTERS

Save maintenance costs on motors and control with Westinghouse Combination Linestarters, providing all the advantages of Nofuze protection, plus motor control, in one compact, economically installed package.



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Save on machine and man time with Westinghouse Nofuze Panelboards for lighting and power circuits. Immediate restoration of current, with no time lost for fuse replacements.

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Motors and Control

not realize how much a modest investment in co-operative research and participation in it might accelerate obtaining needed knowledge and improving materials and methods.

REDUCING COST OF WELDING WITH HIGH-SPEED, AUTOMATIC MACHINERY

BY R. E. KINKEAD
Consulting Engineer Welding, Cleveland

■ A DEFINITE unmistakable trend is evident in the welding field and evidence has piled up in the last year confirming the thesis of a few years ago that high-speed automatic machinery would have to come to reduce cost of welding.

High-speed fully-automatic strip coil welders using flash welding have gone into operation in the last six months in two steel mills. These will be followed by similar automatic equipment in brass and copper mills, bringing about the greatest change in that industry in 50 years. It means the changeover from batch manufacture to continuous processing of the metals; analogous to what happened in the steel and rayon industries in recent years.

A new continuous high-speed automatic arc process is emerging from research secrecy to commercial operation. The Unionmelt process is spreading rapidly and fulfilling its promise. Automatic billet skinning machines are in full operation, replacing manual operations at substantial cost reductions. The end of applying high-speed automatic machinery to welding and cutting operations is not in sight.

NAVY DEPARTMENT CONSTRUCTS FIVE HEAVY SHOP BUILDINGS BY WELDING

BY C. A. TREXEL*
Commander, United States Navy, and Design Manager, Bureau of Yards and Docks, Navy Department, Washington**

■ RECOGNIZING that reliable standards were a prerequisite to adoption of welding for important structures, the Bureau of Yards and Docks early in 1938 began preparation of two standard specifications, one for design and the other for inspection of welded work. They were completed and are now in use though still undergoing change. In the past year five welded, heavy shop buildings were designed and are now under construction. These are the first important buildings of welded construction under the Bureau's cognizance. The Bureau has also during the past year permitted welded bridge crane girders and is requiring the end trucks and trolleys to be welded. For certain purposes, welded construction has been permitted for some years.

Rigid frames are being used more by structural designers for buildings and bridges, as they are particularly adapted to welded design, economical in use of metal, and pleasing in appearance.

Structural fabricating shops are adapting facilities and installing equipment for welding, and accordingly are in a better position to compete on welded designs. These shops are developing more jigs, special clamps and handling equipment to facilitate assembly, and are using positioning equipment and high-speed electrodes to increase shop output. Automatic welding is increasing, though its use on structural work never will be as extensive as on tanks, bridge cranes, and similar structures, on which long seams or straight runs can be made. Future advances most likely will be in improvement and standardization of existing equipment, materials and methods, rather than revolutionary new developments.

The problem is to convince the public on reliability of welding; to furnish standards on welded designs; and to reduce cost of fabrication and erection. A convenient, adequate and inexpensive method of testing shop and field welds would likewise promote the use of welding.

Designing engineers who are not only conversant with the theory of welding but with practical aspects of shop fabrication and field erection as well must be trained. More uniform and less costly requirements for qualification of welders are a need. Special rolled steel sections suited to welded work and reduction of mill tolerances also are needed.

*Opinions or assertions contained herein are the private one of the writer and are not to be construed as official or reflecting the views of the Navy Department or Naval Service, at large.

**The Bureau of Yards and Docks has cognizance of the design and construction of the Naval Shore Establishment as distinguished from the Fleet or Navy afloat. This complex establishment includes Navy Yards, submarine, destroyer and air bases, fuel, supply and ordnance depots, gun and powder factories, radio stations, research and experimental laboratories, training stations, hospitals, and many others which serve the Fleet.

NEW FOUND USES OF OXYACETYLENE FLAME ARE ATTRACTING ATTENTION

BY G. V. SLOTTMAN
Acting Manager, Applied Engineering Department, Air Reduction Sales Co., New York

■ CONSIDERABLE interest is being shown in some recently developed processes utilizing the oxyacetylene flame. These include besides certain novel applications for welding, brazing and cutting, use of the torch for flame hardening, descaling and dehydration.

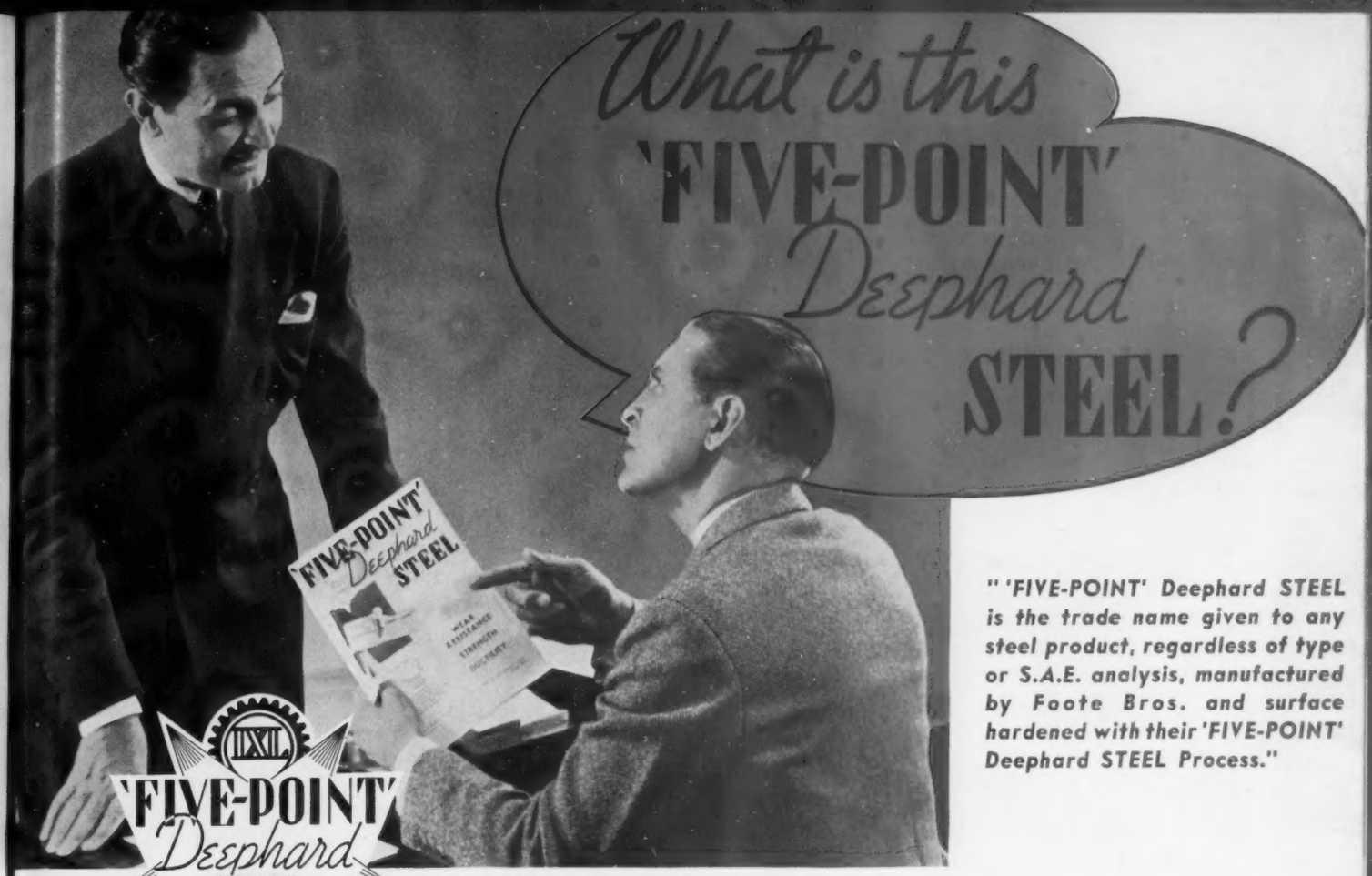
Use of high-creep strength carbon-molybdenum steels for high-pressure and high-temperature pipe is growing rapidly. It has been necessary to develop a satisfactory rod and proper welding technique to join this material with maximum strength welds. Numerous installations the past year have proved this problem to have been satisfactorily solved for oxyacetylene as well as metallic arc applications.

Braze welding of galvanized steel pipe without destroying its corrosion-resistant properties at or near the joint is now a reality. A combination of torch manipulation and application of a high-test liquid flux has made this possible. Also, red brass pipe in all diameters is being braze-welded so that the completed line is actually a one-piece brass installation with strong leakproof joints of essentially the same material.

An interesting innovation in oxyacetylene welding is the flux coated bronze rod. A number of bronze welding rods with extruded or dipped flux coatings now are on the market. Increased tensile strength, ductility and density of filler metal in addition to faster speed of deposition indicate these new rods will be widely accepted.

A device recently introduced provides for the introduction of a flux into the torch flame, thus making it self-fluxing. This eliminates inconvenience of using powdered flux, and in certain applications, particularly light-gage production brazing, it has proved most effective in increasing welding speed and reducing finishing costs.

In oxyacetylene cutting, new types of machines, torches and tips have been introduced. In preparation for welding, plate edges with two and three bevels



IXL

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"Because its superiority over low carbon "hard case" steels, and over high carbon heat treated steels when subjected to surface abrasion, is based upon Five-Points, each of indisputable superiority:

1. Increased hardness in wearing surface (60 - 68 Rockwell "C" depending upon analysis) without fear of brittleness, flaking or spalling.

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3. An evenness and completeness of fusion between the wearing surface hardness and the core area that enables this hardness to be used as a strength factor as well as a resistant to abrasion.

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are being cut with a single pass of a cutting machine. Double and triple bevel cutting are effectively reducing cost of plate edge preparation.

Processes briefly described in the foregoing have to do with welding, brazing or cutting. Perhaps even greater strides have been made with torch applications where the metallic part is not changed in shape. Flame hardening, descaling and dehydrating have to do with treatment of the surfaces or surface layers of objects.

The flame hardening process is being used in an increasing number of plants. Many production lines now are using oxyacetylene equipment for hardening small surface areas that are subjected to excessive wear. Flame hardening by the spinning method is fast and can keep pace with rapidly moving assembly lines.

Use of the oxyacetylene descaling torch for removing mill scale from billets, slabs and blooms in the rolling mill and from steel castings and forgings in the foundry and forge shop is being generally adopted as a fast and satisfactory procedure.

In the structural fabrication shop, oxyacetylene flame cleaning and dehydrating is rapidly being accepted as the most economical, cleanest and safest method of surface conditioning structural steel prior to shop paint-coating. And in the field, this process is meeting with increasing use as a quality means of paint-burning and surface conditioning of old painted steel structures prior to repainting.

CLASSIFICATION OF METALS AS TO WELDABILITY IS A GROWING NEED

BY H. C. BOARDMAN
Research Engineer, Chicago Bridge & Iron Co., Chicago, and President, American Welding Society

■ CONTINUED demand for stainless linings for mild steel shells of welded vessels, and continued keen rivalry among steelmakers, fabricators, and individuals to discover, develop and gain control of the best method of attachment, has been observed in the welding industry this past year. In welded construction, increasing use has been made of alloy steel and nonferrous metals, with consequent new problems of plate and shape making, fabrication, welding, testing, inspection and code writing. The A.S.M.E. code committee has before it continuously problems involving use of these materials for pressure vessels.

Recognition of the need for a classification of metals according to their weldability, that is, according to the conditions necessary for welding them, is growing. There are several able investigators in this line, among them J. C. Hodge, with his studies of effects of carbon and manganese; N. H. Bruckner, with his "weld-quench" tests; and E. C. Bain, with his "S" curves. An idea has been put forth that the American Welding society should soon undertake, as an adjunct to its "Standard Qualification Procedure," preparation of a qualified welding procedure for each group of materials classified according to weldability. If such a procedure were developed and accepted by all users of welded products, manufacturers adopting it would not be required to requalify it.

Whole-hearted co-operation is being given by many individuals and organizations in improving and simplifying codes relating to welding, thereby to relieve the welding industry of the needless and almost intolerable burden which it has borne due to multiplicity of conflicting or overlapping rules and specifications. A report on results of this co-operative effort will be detailed at the annual meeting of the American Welding Society in Chicago.

Among outstanding research efforts of the past year are: Beginning at the University of Illinois of an extensive program of fatigue tests of large welded joints; beginning at Rensselaer Polytechnic institute of a comprehensive research into fundamentals of resistance welding; continued intensified study into the elusive problems of stress corrosion; and development of the uses and techniques of the trepanning and Magnaflux methods of weld inspection.

GROUP ARRANGEMENT OF MATERIALS TO SIMPLIFY WELD QUALIFICATION

BY E. R. FISH
Chief Engineer, Boiler Division, Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

■ ONE of the important fields for application of fusion welding is fabrication of pipelines for high-pressure steam and other purposes. Problems connected with piping systems for high-pressure, high-temperature steam have forced development of special metals capable of withstanding this service. This in turn has made necessary special methods or procedures of welding, each adapted to the material for which it was developed. This includes metallurgy of electrode or rod and its covering, need for and amount of preheating, degree of stress relieving, etc.

All these problems have been studied intensively and, while no standardized procedures have been generally accepted, much progress has been made. These comments apply also in large measure to pressure vessels.

Through generosity of several large manufacturers, some important investigations have been made into design and details of construction of welded branch connections of relatively large piping, results of which will be incorporated in a revision of the American Tentative Standard Code for Pressure Piping now in course of preparation. This code, when completed, will be greatly modernized.

That a definite procedure for welding, to assure production of welds of dependable quality, should be worked out and thereafter that welding operators should be required to demonstrate their ability to produce sound welds while using that procedure, is a principle being generally recognized and followed. To lighten the burden on manufacturers of making demonstration tests of various kinds, the American Welding Society committee having that phase of the work in charge has revised the Report on Standard Qualification Procedure so as to arrange the various alloy materials in groups for each of which one qualification will suffice.

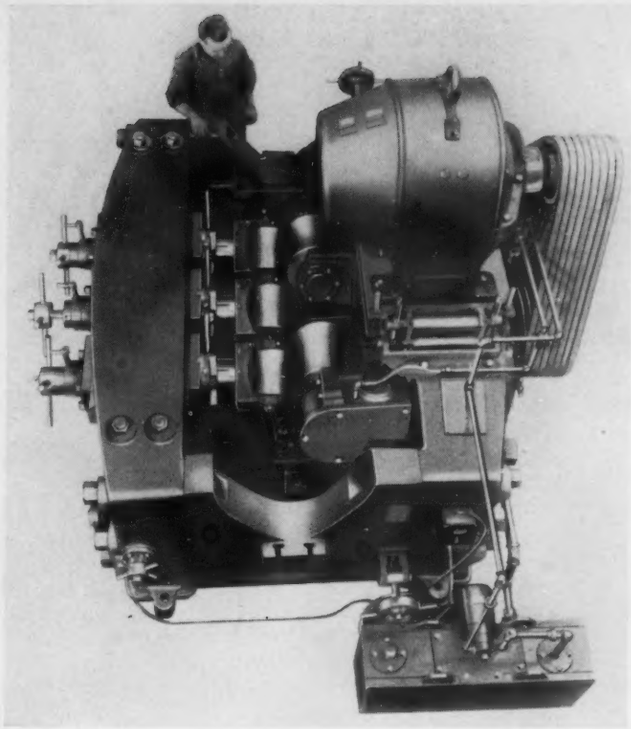
Altogether, study that has been made of many phases of application of welding and publicity given to many of these efforts is highly commendable and adds to assurance that dependable welded structures can be and are being produced.

DESCALING AND GOUGING EXTEND FIELD OF OXYACETYLENE PROCESS

BY H. E. ROCKEFELLER
The Linde Air Products Co., New York

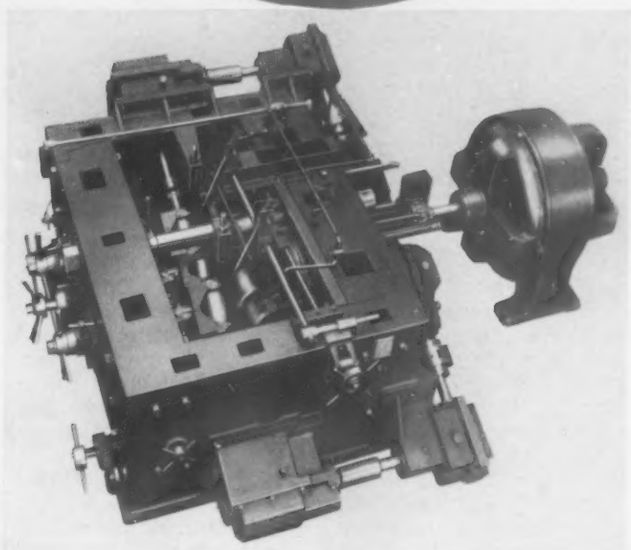
■ NOT SO long ago oxyacetylene developments could be classified readily under two general headings, "welding" and "cutting." Now, however, review of progress must include processes such as flame-hardening, flame-softening, flame-machining, flame-conditioning (deseaming), flame-strengthening, descaling, and gouging. Of these, descaling and gouging are the most recent, having been announced within only the past few

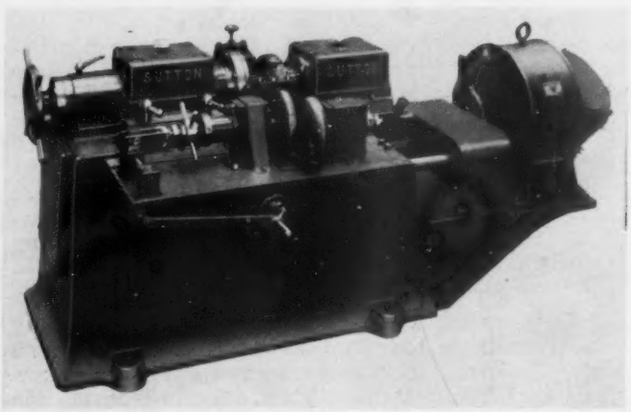
New SUTTON MACHINES



2BM STRAIGHTENER AND 1½B SIZING MACHINE

These machines, like other SUTTON units, are too bulky to send out on trial; however, many clients take advantage of our offer to demonstrate at our plant. Illustrated above is our No. 2 B M machine; this is being used extensively on the new continuous butt weld mills, finding increasing favor with use. Illustrated at the right is our 1½ B heavy duty 4-roll driven sizing machine; micrometer dial screw-downs aid materially in developing amazing accuracy.





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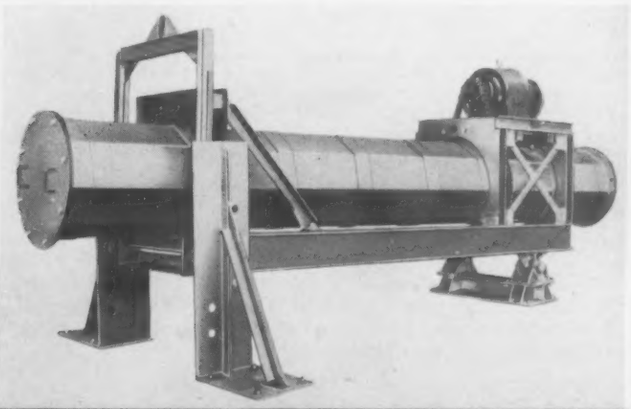
DESCALER . . . Pictured below is the SUTTON ROTARY DESCALER and CLEANER. It can remove rust and loose scale from any hot rolled bar section manufactured, as well as from all structural shapes and narrow plates. It is also serviceable in applying paint or rust proof coatings.



SUTTON ENGINEERING CO. PARK BLDG., PITTSBURGH (PLANT—BELLEFONTE, PA.)

months, and it is safe to say that before many more months they will prove just as invaluable to the metalworker as the other new techniques.

Flame-descaling provides an efficient means for removing scale from blooms, billets, slabs, forgings and steel castings, by means of specially-designed oxyacetylene heating heads. The process is based on the principle that when quick high-temperature heating is applied to scale (or oxide skin) on a piece of cold metal, the scale expands and breaks away from the base metal because of a differential expansion between scale and steel. While descaling has a number of advantages over other cleaning methods, one of the most important is speed. For example, steel foundries find castings can be descaled in one-fifth the time of chipping.

Gouging is to metalworking what the chisel is to woodworking. Already it has proved an inexpensive means for performing in a matter of minutes a wide variety of operations formerly requiring hours of tedious chipping, grinding, and planing. Originally, gouging was developed for removing metal from the underside of welds, for removing weld defects revealed by visual or X-ray inspection, and for removing temporary tack-welds. Immediate success of the gouging blowpipe for this work soon led to its use for a variety of maintenance operations, and, more recently, for preparation of plate edges for welding. Principle is based on the fact that if a nozzle designed to deliver a relatively large jet of oxygen at low velocity is properly manipulated, a smooth, accurately-defined groove can be cut or gouged out of the surface of the metal. This is essentially what is done in conditioning steel when defects are removed by the deseaming blowpipe.

Although possibly overshadowed by the other more recent and more spectacular developments, the oxyacetylene flame has been further consolidating its position as a rapid and economical means for joining metals. Here, the trend has been along lines of more effective utilization of heat. This has resulted in use of multiflame tips and the mechanization of the motion of the blowpipe with respect to the work, particularly in the case of repetitive production operations. Tube welding and barrel welding operations are typical of this class of work. In addition, new welding techniques are extending greatly usefulness of alloy and corrosion-resistant steels.

The oxyacetylene process is rapidly introducing whole new conceptions in the art of metalworking. As the newer "flame-treating" techniques become more widely known, it is believed they will prove as indispensable in fabrication and repair of steel equipment as arc welding and cutting.

INTENSE STUDY IS DIRECTED UPON WELDING OF COPPER-BASE ALLOYS

BY J. R. HUNTER
Welding Engineer,
Revere Copper & Brass Inc., Rome, N. Y.

■ PROGRESS in welding copper-base alloys the past year has been characterized by increased general interest, continued dissemination of already existing knowledge, and continued study and development, rather than by any single accomplishment.

Investigations covering welding of copper and spot welding of copper-base alloys in connection with the program of the copper alloys subcommittee of the Welding Research committee are being continued. Progress in industrial research sometimes is reflected only as it culminates in an improved product. In this connection, it is to be noted that general recognition of the importance of fluxes and rod coatings has been reflected in improvements in the method of, and fluxes available for addition through, the gas welding flame. Coated filler rods for oxyacetylene bronze welding also have been made available.

No material progress has been made in welding copper. A thorough report covering an extensive comparison of relative merits of various welding rods offered commercially for carbon arc and gas welding of copper was made available early in the year. In addition to substantiating for the most part some of the generalizations drawn earlier in a review of the literature for the Welding Research committee, the report provided substantiating evidence as to superior welding qualities of deoxidized copper over those of electrolytic or oxygen-bearing copper. A report on work now in progress in conjunction with the committee's program is expected soon.

Availability of, and extension in, use of the cupro nickels for condenser tube sheets and water box construction has led to established welding techniques.

Silicon bronzes continue to find preference in the copper-base alloy field where welding is necessitated. In a recent revision of the A.S.M.E. Unfired Pressure Vessel code, acceptance cases covering the various commercial alloys were consolidated into one general case. Classification of these alloys on a basis of composition and physical properties, in conjunction with interpretation of acceptance Case 864 that the qualification of welding procedure on one bronze to all bronzes included in the same classification, has clarified the general subject of procedure and welder qualification and should promote general interest and improvement in welded fabrication of these alloys by virtue of prestige attached to being qualified under the code.

THREE PROCESSES ARE DEVELOPED FOR BRAZING OF ALUMINUM ALLOYS

BY G. O. HOGLUND
Welding Engineer,
Aluminum Co. of America, New Kensington, Pa.

■ TO LIST new applications of aluminum alloys involving welding processes is simple; to convey the large amount of research and development conducted to adapt welding processes for these particular uses is difficult. Some of the fields in which more important developments have taken place include wider use of resistance welding in assembling aircraft; use of flash welding for structural parts such as windows; application of metallic arc welding to assembly of tank cars; the greatly increased use of welded beer barrels; and development of a new process involving methods closely akin to welding, in which certain aluminum alloys can be assembled by brazing methods.

Initial production of aluminum alloy parts using brazing methods has been accomplished on a limited scale. To do this it was necessary first to find proper fluxes and filler materials. Three brazing methods are now available for assembling certain aluminum alloys, including furnace brazing, torch brazing and dip brazing. First two have found actual production use, while the last, in which an assembled part is dipped in molten flux, offers promise as an economical way of assembling complicated parts. Over 25,000 outboard engine tanks are being furnace brazed in 1939 production.

Increased activity in production of aircraft, brought about by commercial and military programs, has increased use of resistance welding, particularly spot welding, as a joining tool in this field. Equipment for spot welding aluminum alloys and information on the

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We further guarantee that the use of our X-1515, X-1535 and X-1545 steels as compared with any of the above SAE steels, in the respective carbon ranges, will enable you to produce a stronger and better part in every way at a lower net cost and with 2 to 10 times greater tool life.

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characteristics of spot welded joints has been gathered for the past four or five years. Actual production use of this tool has increased during the past year so that now practically all aircraft manufacturing plants are operating one or more welding machines.

Wider utilization of arc welding also has been apparent, although the gas torch still is the most widely-used tool for welding aluminum alloy parts. For example, it has been standard practice to assemble tank cars from ½-inch aluminum-manganese plate by gas welding. In an attempt to lower welding costs, several tank cars were assembled with metallic arc after impact tests on a model tank and conventional qualification tests indicated that properties of metallic arc welds were adequate. Production use of the metallic arc in assembling tank cars showed a considerable saving in actual welding costs, and in addition reduced distortion in tank shell.

Perhaps the outstanding successful application of welding concerns the welded aluminum beer barrel. About 150,000 barrels were produced in a heat-treated aluminum-magnesium-silicon-chromium alloy and assembled by gas welding. Performance of aluminum in providing more economical handling of beer has been highly satisfactory.

NEW ELECTRODES AID WELDING OF COPPER ALLOYS BY METALLIC ARC

BY I. T. HOOK
Research Engineer,
American Brass Co., Waterbury, Conn.

■ WELDING is an extremely useful production tool in fabrication of copper alloys. Manufacture of riveted copper pressure vessels always has been a difficult problem, the limited response of copper to caulking and the fact that leaks do not readily corrode shut having made it so. Hence, welding with its pressure tightness and strength has proved to be the most desirable method of connecting copper or copper alloy sheets.

Soldering, brazing and welding of copper alloys—welding seems to be the key word in this new group of joining processes but its junior partners—soft soldering, silver brazing, spelter and copper brazing and bronze welding, often are more economical and less difficult to apply than fusion welding. Thus in 1939 house building, copper tubing with soft soldered cast brass or wrought copper fittings is being used widely for hot and cold water services.

Red brass pipe is installed with threaded fittings in many monumental buildings but some master plumbers prefer the more economical and adaptable installation by bronze welding. A current heating installation in Connecticut uses bronze welded red brass pipe in sizes from 1½ to 6 inches for condensate return. An interesting example of red brass pipe with bronze welded line connections was furnished by a 3-inch gas main used for six years under the brackish waters of a Pacific Coast estuary. When taken up, welds were found intact and the pipe as a whole in such excellent condition as to be returnable to stock.

Paper manufacturers long have been using copper tubes in large sizes for conveying corrosive liquors and pulp. Many such tubes have been made of rolled-up copper sheet with longitudinal seams, line connections and branch connections bronze welded with oxy-acetylene torch. More recently, they have found large diameters, 8 to 12 inches, in cold drawn deoxidized copper tubes to be preferable, offering less frictional head to passage of pulp. Ends and branches are readily welded with Tobin bronze.

Copper bus bar installations are being made with lapped, scarfed or butt strap joints sweated with a silver brazing alloy. Advantages are claimed for such connections by way of strength and perfect electrical properties which do not change with time.

Marked improvement in weld metal which followed introduction of covered electrodes in ferrous welding led to the idea that improvements in copper alloy welding lay in metallic arc procedure. Early in the year, a covered electrode for the 70/30 cupro-nickel alloy was made available. This covered electrode facilitates welding of copper-nickel alloys which have such an excellent record as regards corrosion resistance in sea water.

A flux-coated copper welding rod has been offered recently for metallic arc welding of copper sheets. If preheat at the starting point is used to avoid a cold start, a satisfactory weld is obtained. Further improvements in copper welding can be expected in the near future.

Aluminum bronze alloys, useful for their strength, corrosion resistance and nonscaling properties, always have been difficult to weld. No flux has been found which will completely eliminate difficulties from refractory aluminum oxide film on the weld pool. However, by use of a carbon arc, interference of the aluminum oxide film is forestalled and sound, strong welds are made. For silver brazing, several new high fluoride fluxes have been offered which makes this process easier on the aluminum bronzes, silicon and beryllium copper alloys.

Silicon-copper alloys, carrying approximately 96 per cent copper, are still favorite metals for fusion welded hot water storage tanks. Many of these are carbon arc welded using bare silicon-copper alloy filler rod but many also are welded by oxyacetylene torch. A few have been welded by metallic arc using a bare copper-alloy electrode. Wider application of the last method hinges largely on development of a thoroughly satisfactory covered electrode.

MILLS PRODUCING WIRE TO MEET MORE EXACTING SPECIFICATIONS

BY FREDERICK A. WESTPHAL
Superintendent of Wire Mills,
Sheffield Steel Corp., Kansas City, Mo., and
President, Wire Association

■ IN SPITE of perplexing wartimes, the wire industry can visualize the future with confidence. Operating men, metallurgists and engineers are constantly striving for better control of manufacture and better quality of product.

Steelmaking departments are becoming more customer conscious and are endeavoring to produce steel which will meet exacting specifications. Co-operating with the research and the metallurgical departments, they are helping to solve intricate problems traceable to the steel itself.

Billet and rod mills are now built with auxiliary handling equipment which permits 600 to 900-pound coils of finished rods to be rolled. Thus larger increment loads can be subsequently processed. This should reflect favorably on yields and conversion costs. This trend is leading toward a goal of 2000 to 3000-pound continuous length coils of rods.

Electrolytic cleaning of batches of rods and wire with catalytic agents is accomplishing more thorough and rapid cleaning. Furthermore, it is now possible to dispatch larger increment loads to straight-line cleaning tanks equipped with power-driven agitators to accelerate the chemical reaction. New layouts combine these units with flash baking equipment, and rods or wire from the rod mills or from stock can be prepared

and delivered to drawing machines in approximately 30 minutes, compared with an average of 6 to 10 hours by former practice.

Machinery for continuous wire drawing is greatly improved and makes use of tungsten carbide dies. Speed of drawing for nearly all types and grades of ferrous, nonferrous and alloy wire has been increased. These are important factors contributing greatly to higher production and superior quality.

With advances in materials handling systems, conveyors, cranes and tractors, we should anticipate progress in future engineering and construction. Wire production of the future probably will be more nearly on an assembly-line basis through use of streamline methods, increased increment loads, larger heats of steel and nonferrous metals, larger ingots, heavier billets and larger continuous-length coils.

AMERICAN WIRE MILLS EQUIPPED TO HANDLE ANY WAR EXPORT DEMANDS

BY KENNETH B. LEWIS
Consulting Engineer, Worcester, Mass.

■ LEADING topic in wire mill circles today is the European war, and its possible effect on export demand. No two wars are alike. This one, unlike the last, finds the democratic nations prepared, and it is unlikely their imports will follow any previous pattern. There is the further difference that industrial areas which were a battle ground in 1914 may be spared, that trench warfare on a large scale may not develop, and that anti-submarine strategy may call for a "war of movement" instead of nets and mine fields. A fair guess is that this country will be asked to supply semifinished rather than finished goods in all the metal categories. In fact, these early days have seen exactly that development; rods and billets are in demand, with American mills strongly disinclined to part with anything but finished wire.

In any event, American mills are in good shape to cope with any situation. During the last year or two many leading mills have pushed forward quietly with modernizing programs involving, one by one, all the basic operations.

It is difficult to point to any outstanding development, but technical progress in the preparatory operations, in the wire room and in annealing, has been steady and satisfactory. The record of 1939 has been one of acceptance and improvement rather than innovation. In the cleaning house, straight-line arrangement has definitely established itself, and with it the flash baker; handling problems have been greatly simplified by this combination. Man-minutes per ton from rod yard to wire machine are likely to hit a new low when some more recent installations report. Mechanical agitation of rods in the acid is being tried again, and submerged flame heating of the acid bath is fighting hard for a footing.

In the wire room, the many years of steady plugging by manufacturers of continuous machines is now definitely crowned with success, and except in a few highly specialized products the orthodox wire bench is on the way out. High speed and artificial cooling are the rule. Carbide dies continue to improve, and are a tremendous factor in success of countless small advances in technique and in finished quality.

Pot annealing outfits are moving into the class of precision instruments. Both the hood type, borrowed a few years ago from sheet mill practice, and the more familiar pit type, are delivering uniformity of temper and excellence of finish impossible a few years ago.

Among specialties, stainless steel wire may be due for an advance. Mill practice is still in the under-cover stage, but in both the metallic and nonmetallic coatings progress has been steady with costs creeping down, and it is felt every reduction will open a wider market.

WIRE QUALITY IMPROVES DESPITE SPEED-UP IN PRODUCTION METHODS

BY B. L. McCARTHY
Chief Metallurgist,
Wickwire Spencer Steel Co., Buffalo

■ THE TREND toward higher drawing speeds continues in the wire industry. Speeds up to 2000 feet per minute are now being employed and use of higher speeds is becoming more universal. High-speed operation has placed an extra demand on materials used as lubricants and indications are that lubrication will receive considerable attention in the near future.

Use of bakers wherein air is moved about the stock at high velocity is now well established as good practice. Baking periods of from 5 to 8 minutes for low carbon and 10 to 12 minutes for high carbon steel are replacing the old 6 to 8-hour baking time, as this new equipment is being added.

Development of specifications for spring wire by the American Society for Testing Materials constitutes a step in the direction of standardization of this product. Even though the specifications are general in nature, they tend to stabilize wire specifications generally.

The microscope is being used more extensively in the wire industry as a guide for heat treatments, and such terms as grain size, spheroidize-anneal, fine pearlite, etc., which require microscopic examination to establish them, are becoming more common. As a result, wire with higher tensile strength and greater ductility is being produced because scientific studies enables the wire mill technical man to control variables better.

In general, application of scientific and engineering knowledge has raised standards of quality of wire being produced and indications are that this trend will continue.

FEWER SURFACE DEFECTS IN WIRE WITH CLOSE STEELMAKING CONTROL

BY H. C. BOYNTON
Metallurgist,
John A. Roebling's Sons Co., Trenton, N. J.

■ TO PRODUCE wire free from surface defects, wire manufacturers are exerting closer control over steelmaking, resorting to spectroscopic examination of raw materials to make cleaner and more uniform steel. Grain size control is the subject of much research, for customers are demanding specified grain size.

Cemented carbide dies are improving wire quality and finish and are in wide use. At present, these dies are made up to 6 inches inside diameter and 14 inches outside diameter with holes finished to mirror polish. Wire pickling is rapidly becoming a continuous process with equipment enclosed and fumes exhausted. Regeneration of spent acid is claimed to be successful and economical. Baking now requires only minutes instead of hours as formerly.

Use of carbide dies, production of bigger bundles, and faster moving drawing machines equipped with block and die cooling devices, are demanding better die lubrication. While it is not accurate to say the old sull and heavy lime coat is rapidly disappearing, it is being re-

placed by lighter coats of all combinations of metals and alloys which are used for rustproofing and other requirements. We now have coats of copper and tin, both in straw and white shades; stearates, chromates and phosphates; red lead and oil. and other patented combinations. The industry still is seeking an inexpensive, fairly rustproof coating that will not flake on ordinary bending, and will not tarnish in humid weather.

Better atmospheric and temperature controls for patenting and annealing are being used. Some wire is now patented by electric resistance heating, a few plants having installed such equipment. Greater uniformity, finer grain size and enhanced physical properties are advantages claimed.

"Back pull," or "reactive" wire drawing still is under experimentation, but we have yet to hear of successful use. A wholly new style of drawing machine is out. Die is mounted on a revolving drum and traverses a circular path around a stationary block on which each newly formed coil of wire pushes the preceding coil onto a collecting holder, which can be removed when full and a new holder substituted without stopping the machine. Advantages claimed are reductions in power, labor and danger to operator. Wire can be gaged while running.

Stiffness is coming to the front as an important property in wire testing. A new method of testing, apparently originating in Germany, is being experimented with. The unit, called a torsion-vibrating or damping machine, measures damping characteristics. Results are said to be relatively independent of surface irregularities; amount of cold work and aging characteristics are measured and classified. This may become an important tool since the test piece is not damaged or destroyed.

Relative merits of hot versus electrogalvanizing still are being thoroughly tested. Both have their advocates. Certain investigators find from service tests that if coatings are equal there is little choice between the two methods. Aluminum-coated steel wire has made its appearance once more. Sponsors claim good adherence and that the aluminum oxide coating is protective and permanent, even where sulphur is present.

WIRE INDUSTRY RAISES QUALITY OF PRODUCT AND REDUCES COSTS

BY J. A. MORITZ
Vice President in Charge of Operations,
Mid-States Steel & Wire Co., Crawfordsville, Ind., and
Superintendent of Wire Mills,
Keystone Steel & Wire Co., Peoria, Ill.

■ THE WIRE industry stands on the threshold of the greatest development since its inception, not from a production standpoint but from that of quality and costs. The many new laws heaped upon industry have increased costs and lessened respect of the worker for quality and his regard and appreciation of his job. Executives, always mindful of existing conditions, have noted this trend and are now awakening to their responsibilities in their respective companies. This situation has become the paramount issue in industry today.

Much progress has been made in the wire industry in the past year or so in improving quality and reducing costs. Various types of new wire mill equipment are on the market. Modern wire drawing machines with variable speed, water and air-cooled devices have practically doubled tonnage made in the past with antiquated equipment. Cemented carbide dies having become an important factor in the drawing of wire are now developing into other uses in wire mill equipment, such as nail dies, knives, etc., in the nail department; dies, spindles, etc., on fence machines; and knives, thimbles, buttons, and the like, on straightening and cutting machines. These applications of carbides improve quality and reduce costs.

Successful wire producers of the future will be only those which today are looking forward with true conviction of their ideals and continue to progress in accordance with priniples established through the years.

COPPER WIRE MANUFACTURERS SEEK TO ELIMINATE SURFACE DEFECTS

BY E. W. CLARK
Mechanical Engineer, Wire and Cable Section,
General Electric Co., Schenectady, N. Y., and
Vice President, Wire Association

■ IMPROVEMENTS in design and manufacturing methods by apparatus manufacturers have continued to keep wire manufacturers continuously alert to meet ever-increasing demand for a more uniformly perfect product. The past year has brought forth several distinct advances in the art of manufacturing nonferrous wire. Present comments will deal particularly with those applying to copper wire manufacturing and use.

Imperfections on the surface of wire long have been a source of trouble to insulators and users of insulated wire. Processes have been developed that eliminate imperfections, such as slivers, rolled-in scale, pits, etc., and produce a smooth and clean surface.

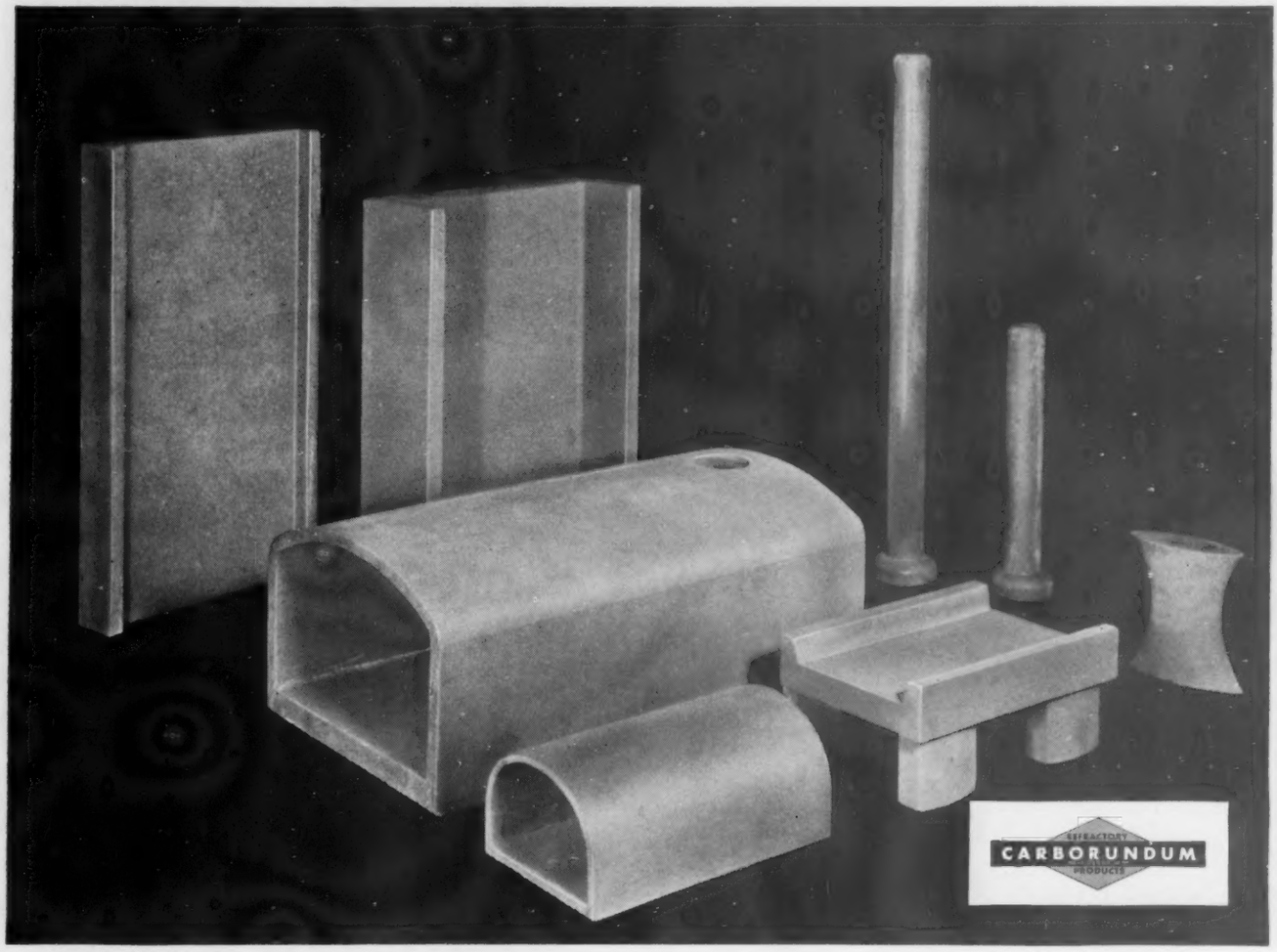
It has been realized for some years that elongation and tensile strength tests no longer are adequate to determine temper and physical qualities of copper wire. Various test methods have been developed to enable the wire manufacturer to determine whether his finished product is uniform as to temper. Apparently, stress-strain characteristics give best indications of this.

To the layman, commercial electrolytic copper is a pure copper. The wire manufacturer has come to realize that commercial copper is an alloy of many constituents, some of which affect its physical qualities considerably. To control this condition, it is necessary to test all lots of copper received to determine the qualities and adjust processes of manufacture to compensate for differences in material as received.

New methods of continuous annealing are being developed and some are in use in combination with enameling and tinning processes. Chemically manufactured resins are coming into general use in manufacture of enamels and varnishes for insulation. Wire enameled with these materials will stand greater mechanical abuse and is more resistant to effects of oil and heat when incorporated in apparatus.

In manufacture of wire today, old rule of thumb that existed for years in this industry is dead. Careful supervision and laboratory control of all processes are requisites for a satisfactory product.

THE BUSIEST REFRACTORY PRODUCTS IN THE METAL INDUSTRY



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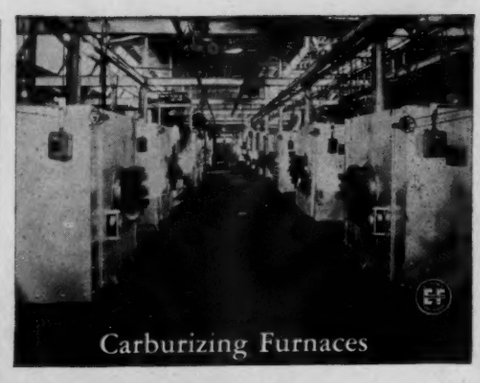
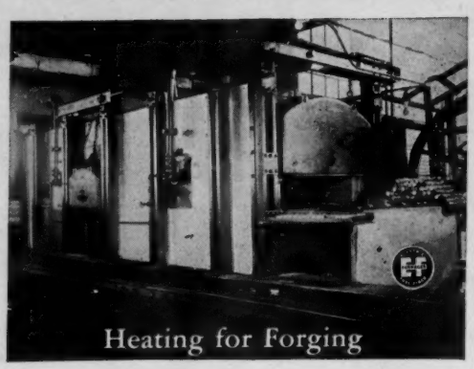
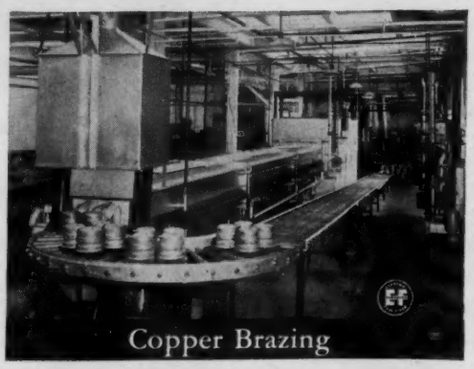


Carburizing Furnaces

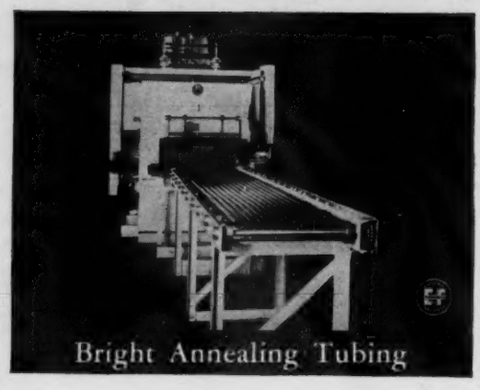


Heating for Forging



Copper Brazing

Scale-Free Hardening



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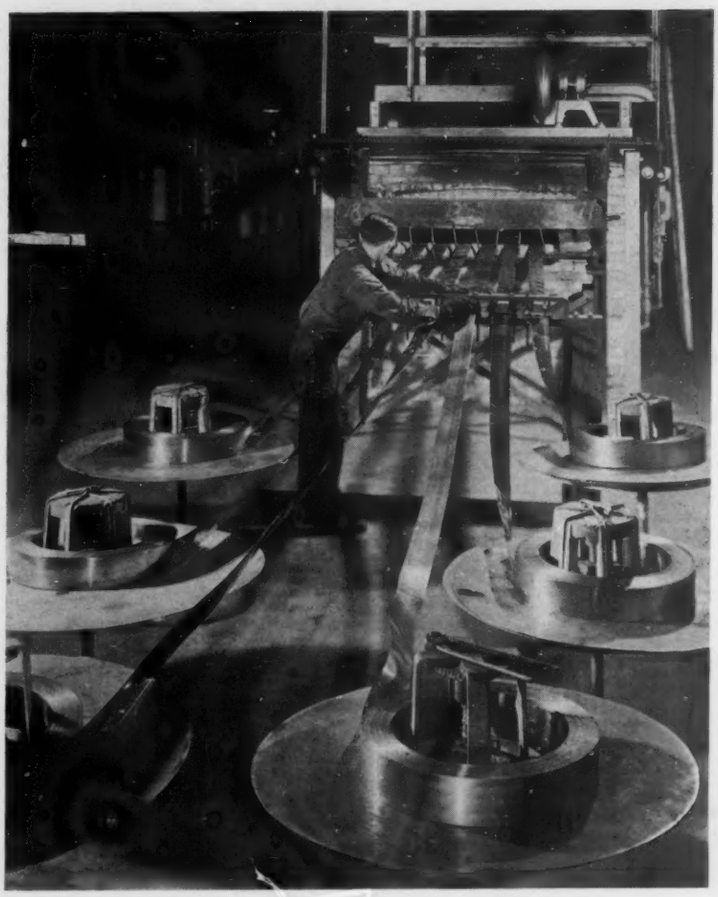
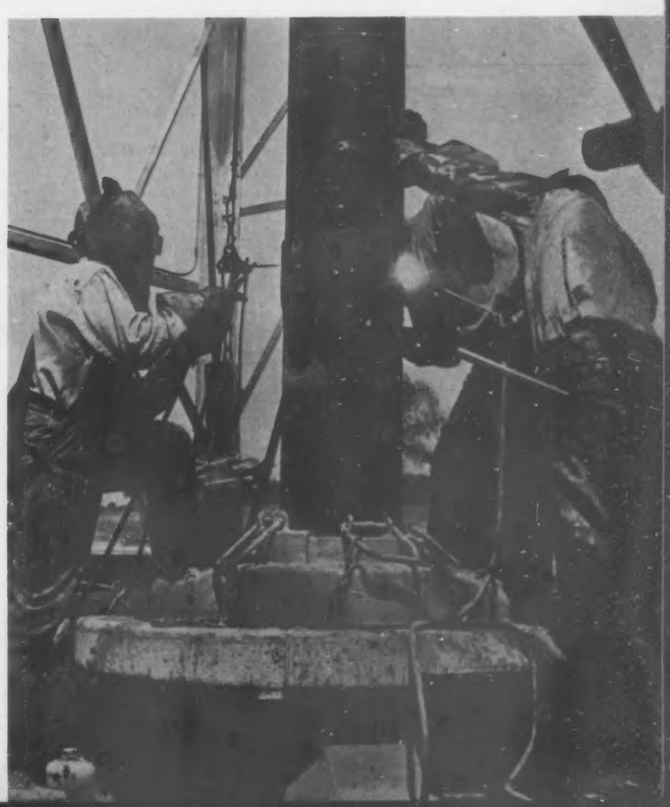


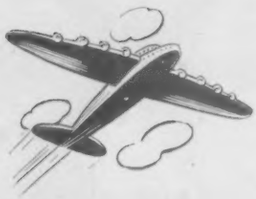
■ Hot rolling tungsten and molybdenum bars into sheets for manufacture of electrical contacts and special products is shown above. Bars are heated to 1200 to 1400 degrees Cent. before rolling. As the stock becomes thinner, roll pressure is increased, temperature decreased. Minimum gage of 0.00075-inch in ductile tungsten ribbon is achieved in 1400 passes. Photo courtesy P. R. Mallory & Co. Inc., Indianapolis

■ Narrow stainless steel strip entering an annealing furnace at the Cuyahoga Works, American Steel & Wire Co., Cleveland, is illustrated at left. Speed of travel is 3 to 12 feet per minute. The furnace, 30 feet long and 42 inches wide, burns natural gas, operates at about 2000 degrees Fahr.

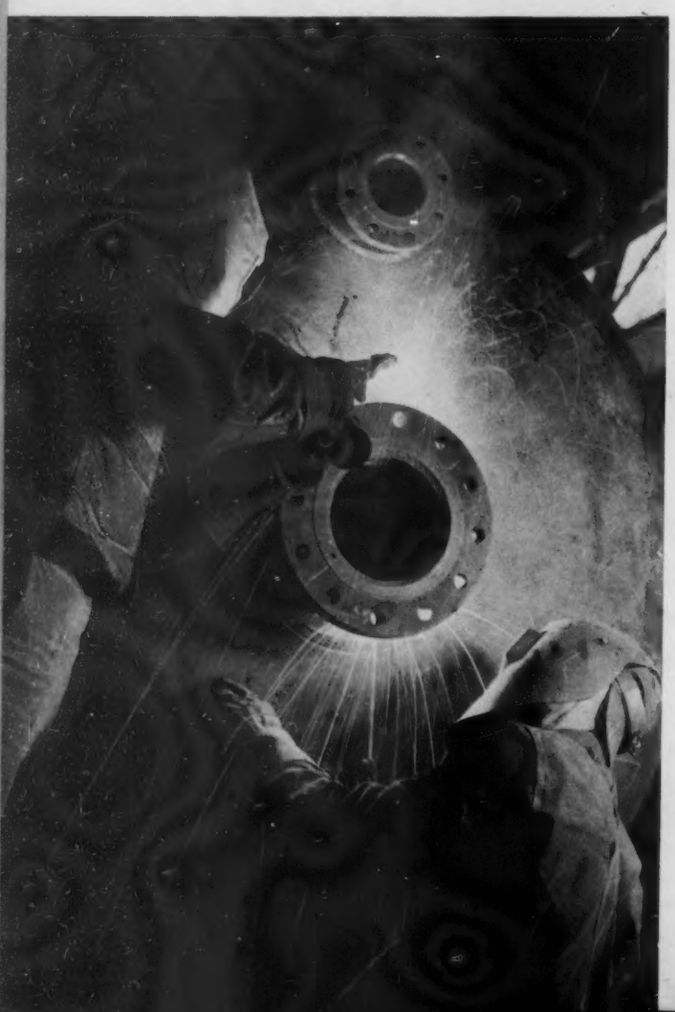


■ Arc welding has established itself as an economical method for making joints in oil well casings. Illustration at the right shows a bell and spigot type of joint being made on a 14-inch diameter casing at Well Frank J. Dore No. 1 located in the Monte Bello field east of Los Angeles. Three welders complete a joint in from 4 to 5 minutes. Photo courtesy Lincoln Electric Co., Cleveland

■ The gas-fired furnace (left) built by Holcroft & Co., Detroit, and installed in a Michigan automobile plant, skin-case gas carburizes or carbo-nitrides 1250 pounds of gears per hour to required case depth of 0.005-0.006-inch. Equipped with a special atmosphere generator, furnace operates at 1500 degrees Fahr. and is controlled in five zones. Work is pushed through on trays by hydraulic pusher, carried through quench tank by hydraulic lowerator, transfer and elevator

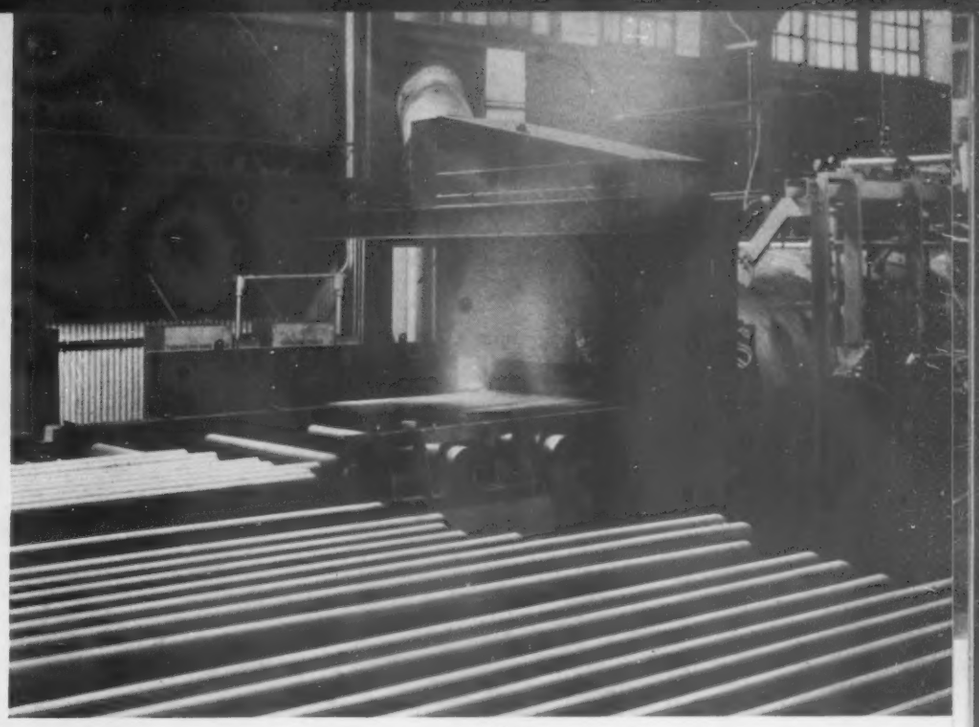


■ Shown below are two operators in plant of Wyatt Metal & Boiler Works, Houston, Tex., arc welding an 18-inch nozzle into 1⅜-inch thick head of fractionating tower, 10 feet diameter, 72 feet long, for a gulf Coast oil refinery. Working pressure of vessel is 300 pounds per square inch. Tower weighs 175,000 pounds and was built in accordance with A.P.I.-A.S.M.E. code. All seams were radiographed, and entire vessel stress relieved

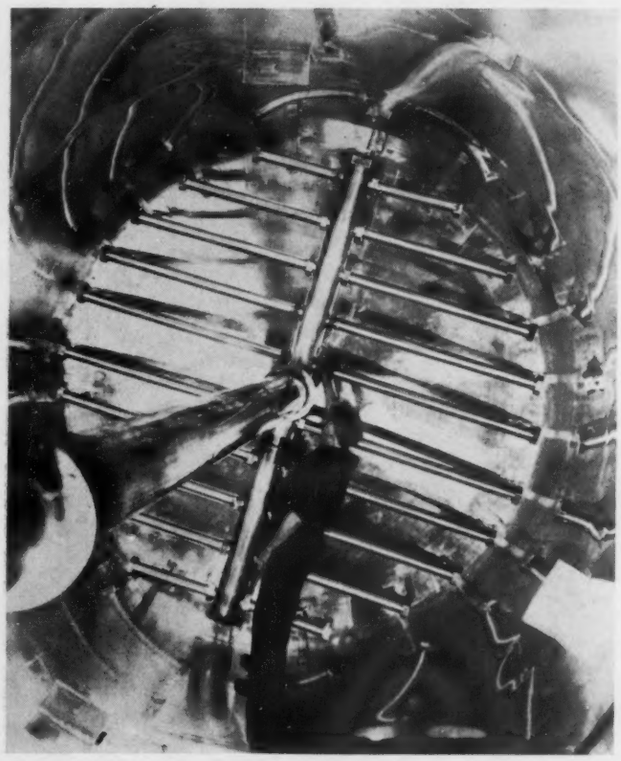


■ Illustration above shows a Kennametal tipped tool turning a chrome-nickel-molybdenum steel forging, 10 inches diameter, 12 feet long, at ⅜ to $\frac{7}{16}$-inch depth of cut on scaly surface with 1/32-inch feed and speed of 150 feet per minute. This steel is 42 to 46 scleroscope, or 276 to 323 brinell in hardness. Tool has a shank 1½ x 2 inches with ⅝ x ¾ x 1¼-inch tip set at 45-degree side cutting edge angle. It has 6 degrees clearance and 8 degrees back rake from 45-degree line on cutting edge, and ⅛-inch nose radius. Down time for regrinding is low and tools hold size over long bar lengths. Photo courtesy McKenna Metals Co., Latrobe, Pa.

Metals . . . .
PICTORIALLY SPEAKING

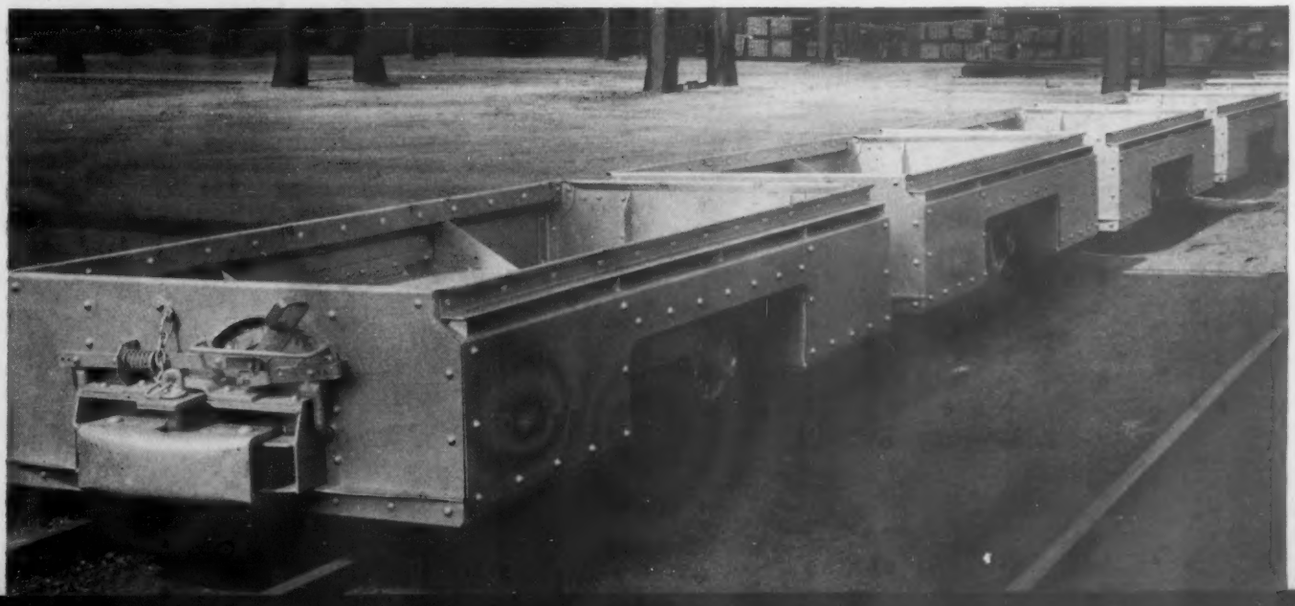


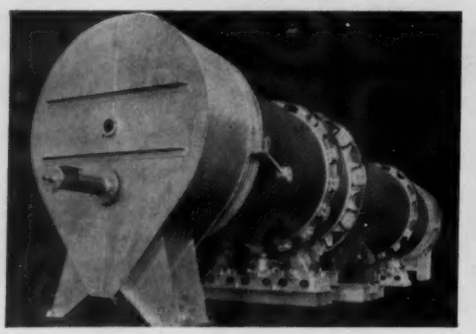
■ This gas-fired, roller-type, tubular furnace (right) for tubular products, built by Salem Engineering Co., Salem, O., and installed in a Pittsburgh district steel plant, has a capacity of 18 tons per hour when operating at a normalizing temperature of 1650 degrees Fahr. Temperature is controlled in five zones. Designed primarily to handle pipe 50 feet long, 14⅜ inches diameter, furnace has 6-foot inside diameter and 100-foot length between doors. A 60-foot length of roller table is provided at each end with majority of rollers driven



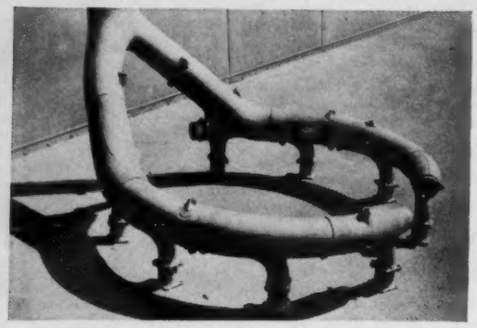
■ Interior of one of four electrically-welded stainless steel yeast fermenters (left), 12 feet diameter and 2½ feet long, fabricated by the Pfaudler Co., Rochester, N. Y., shows construction of aerator pipes. Weight is 21,000 pounds, capacity 15,000 gallons, operating pressure 20 pounds. Aerator pipes and liner are 18-8 type 304 stainless with No. 4 polish. Units are insulated with 2-inch corkboard, then sheathed with $\frac{7}{16}$-inch steel, all welded

■ Ebensburg Coal Co., Colver, Pa., effected 17 per cent weight reduction and longer service life for 800 mine cars through use of Mayari R, high-strength, corrosion-resisting steel. Car capacity is 114 cubic feet. Mayari R, a product of Bethlehem Steel Co., has atmospheric corrosion resistance five to six times greater than mild carbon steel. Illustration (below) shows a group of finished cars in Bethlehem's car shop, Johnstown, Pa., where half the cars were built

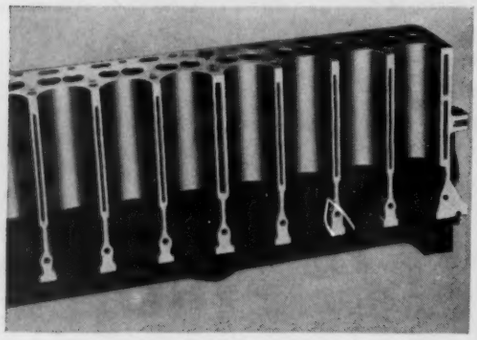




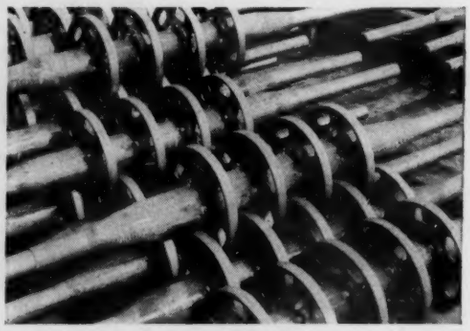
CHEMICAL—This giant rotary kiln is fabricated from 27,800 pounds of 25-12 chromium-nickel steel in order to withstand the damaging heat of high-temperature processes.



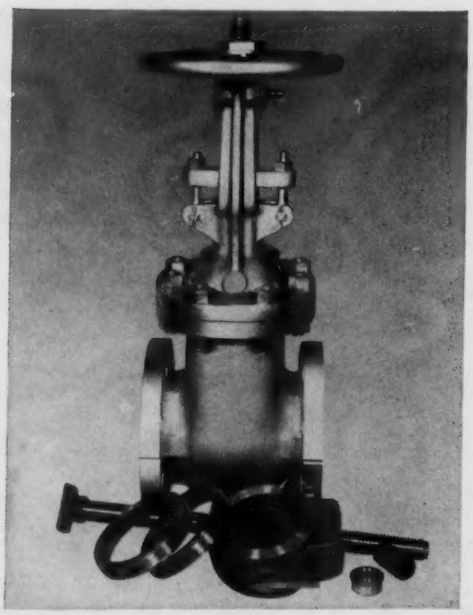
AIRCRAFT—This aircraft engine collector ring is fabricated from 18-8 chromium-nickel steel to resist the extremely high temperatures of exhaust gases to which it is exposed.

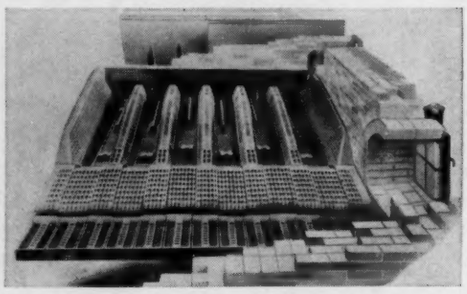


AUTOMOTIVE—This chromium-molybdenum cast iron cylinder block will stand up well under high temperatures, is readily machinable, and takes a high polish.



HEAT-TREATING—These dry shafts for a continuous pack heating furnace are fabricated from high-chromium steel which enables them to withstand the heat of the furnace.





POWER—All castings in the modern stoker layout above are made of cast iron containing from 0.6 to 1.0 per cent of chromium which prevents damage from overheating.

OIL REFINING—Working parts of this 150-pound gate valve (left) are made of 11.5 to 13 per cent straight chromium iron to resist the high temperatures encountered.

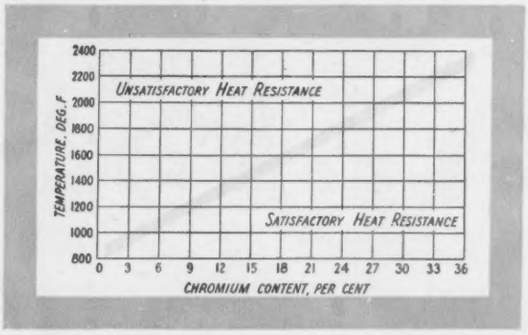
On HOT jobs—Chromium Safeguards Equipment Investment

CHROMIUM-ALLOYED iron and steel can stave off the oxidation that blasts equipment investments where high temperatures are encountered.

Chromium iron stoker links can wade continuously through raging furnace temperatures and remain in satisfactory condition many times longer than iron without chromium. In roasting kilns, it is chromium-alloyed steels that last indefinitely against the effects of searing temperatures.

Vital performance of aircraft engines is safeguarded by chromium steel exhaust valves and manifolds where the flaming heat of burned gases would make short work of ordinary steel. Even in the inferno of annealing furnaces, high-chromium steels give long and satisfactory service.

We do not make iron or steel—but if you do—or if you fabricate or use equipment subject to high temperatures or other conditions where ordinary steels will not serve—"Electromet" offers without obligation unbiased metallurgical data and assistance in solving your alloy problems.



CURVE—The curve above shows the relationship between chromium content and temperature, based on chromium steels found satisfactory in service.

There is an "Electromet" chromium alloy for making every type of chromium iron and steel. These alloys include Special Foundry Grade Ferrochrome for making ladle additions of chromium to cast iron, Chromium Briquets for making cupola additions of chromium to cast iron, Low-Carbon Ferrochrome for making low-carbon chromium steels, High-Carbon Ferrochrome for making higher-carbon chromium steels, and High-Nitrogen Ferrochrome for making fine-grained high-chromium steels.

ELECTRO METALLURGICAL COMPANY

Unit of Union Carbide and Carbon Corporation

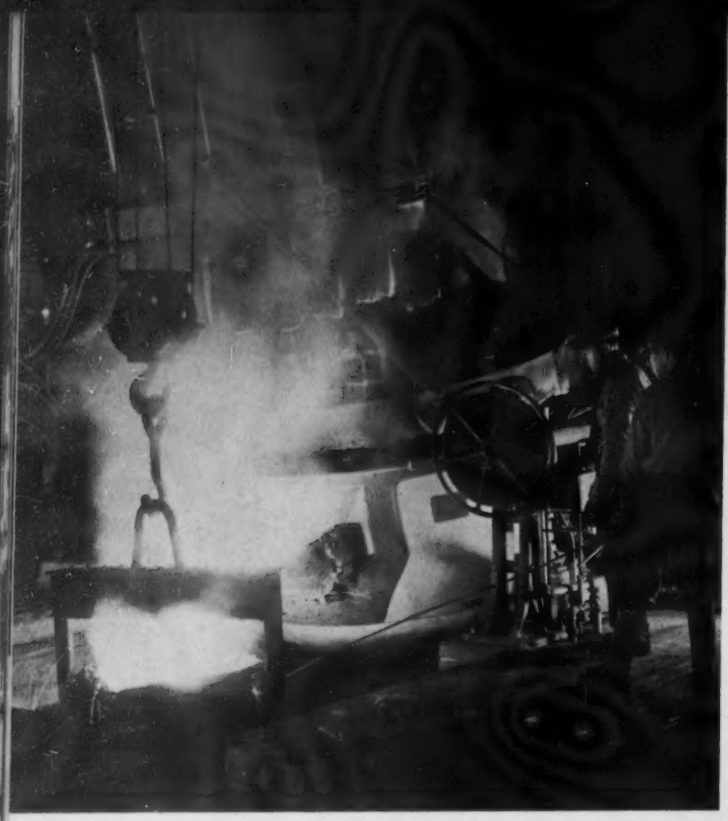
30 East 42nd Street UCC New York, N. Y.

In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

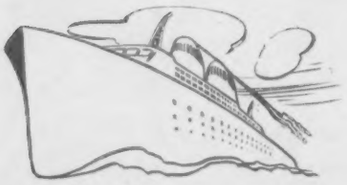
The word "Electromet" is a registered trade-mark of Electro Metallurgical Company

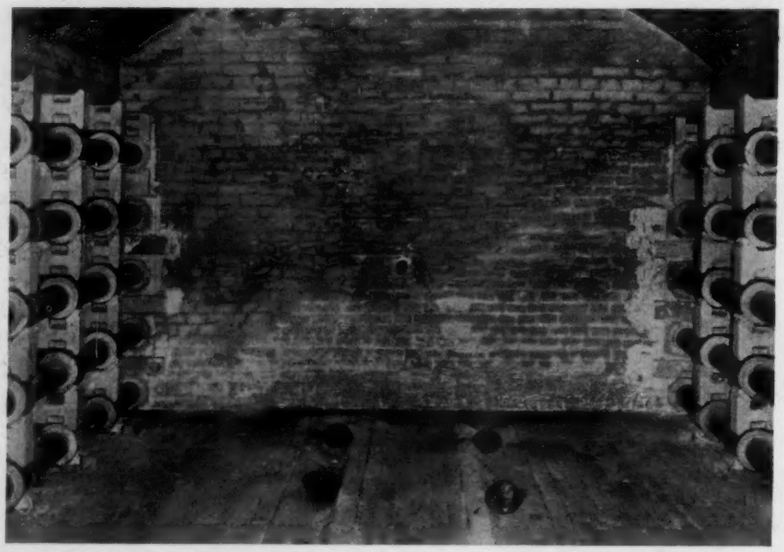
***At the Show*—You can learn more about chromium, and how it imparts heat resistance and other valuable properties to iron and steel, at the Electromet exhibit, Area L305, National Metal Exposition, International Amphitheatre, Chicago, October 23-27, 1939. Plan now to attend and bring your questions.**

Electromet
Trade Mark
Ferro-Alloys & Metals

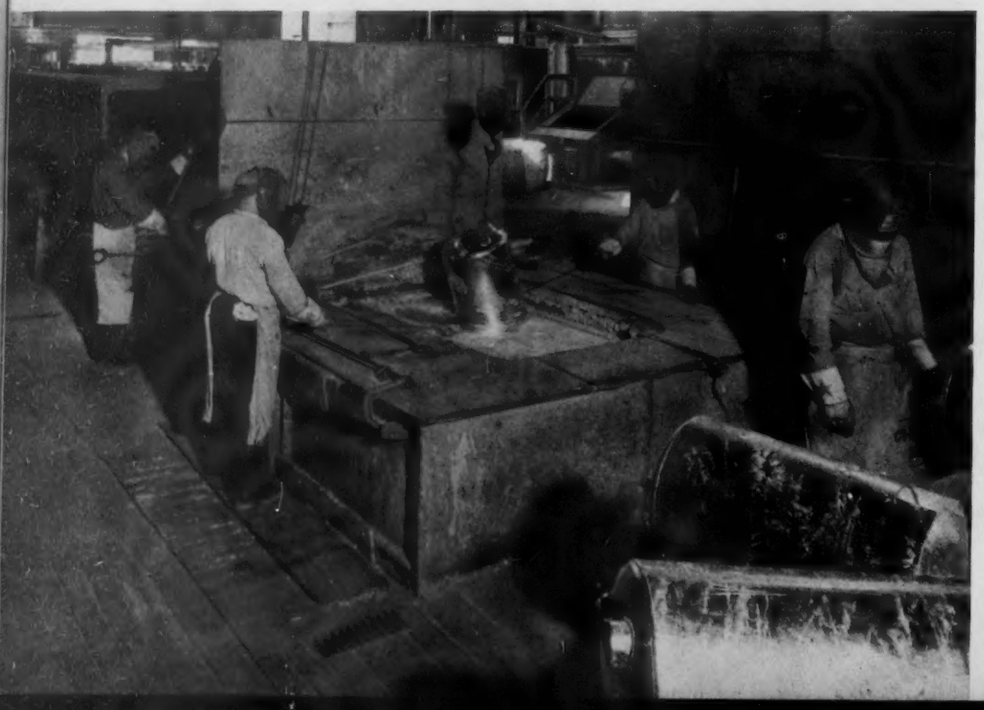


■ Despite improvements in all processes of steelmaking, the electric furnace stands predominant in production of high-quality carbon and alloy steels, stainless steels and special steels. About 2 per cent of all steel made in the United States is melted in electric furnaces. Large tonnages of gray and malleable irons, and special alloys for castings also are produced electrically. The 6-ton tilting arc furnace (left), built by Pittsburgh Lectromelt Furnace Corp., Pittsburgh, pours 5-ton heats of quality steels at intervals of less than 2 hours





■ Refractory radiant heating tubes feature the furnace (right) for annealing silicon steel sheets. Built by the Gas Machinery Co., Cleveland, the unit inside is 15½ feet long, 11 feet wide, 5½ feet high to base of arch. Sheets are heated to maximum of 1950 degrees Fahr., the cycle comprising a slow heating and soaking period and slow cooling period, total time being approximately 10 days. Ten tubes, five along each wall, are fired by special diffusion-type natural gas burners

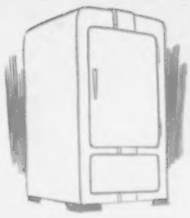


■ Hot dip galvanizing of tanks in the plant of William B. Scaife Co., Oakmont, Pa., is depicted in the illustration at left. Setting for the kettle was built by Pennsylvania Industrial Engineers Inc., Pittsburgh. Tanks move continuously from the pickling department in background, through a drying oven, into the spelter where they are submerged and passed beneath a dam located directly below baffle, raised for draining, and swung onto a conveyor in the foreground to be taken to the testing department. Two of these lines are in use in this plant

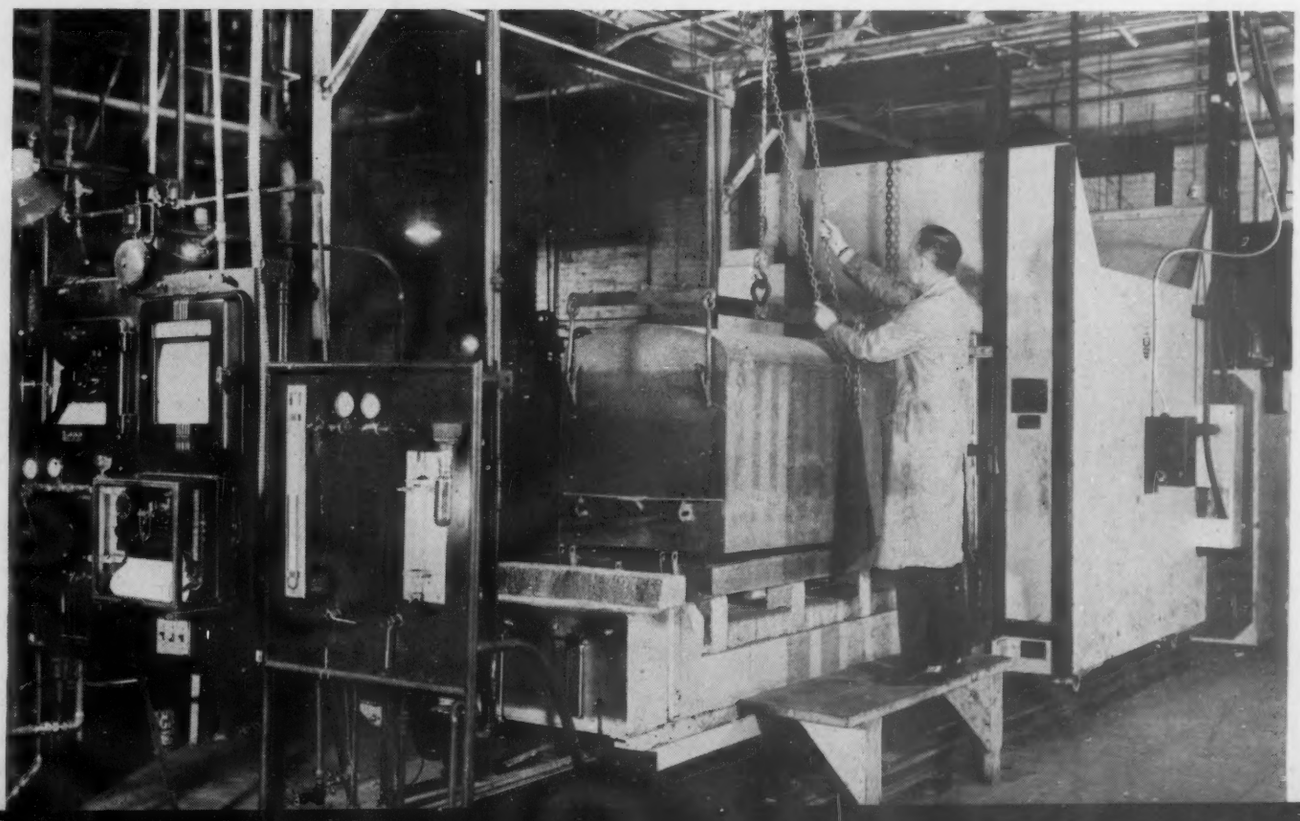
Metals . . . .
PICTORIALLY SPEAKING

■ Finish machining operations on variable-pitch airplane propeller blade bushings made from centrifugally-cast Ampco Metal grade 18 are shown at right. Machine in foreground turns tapered outside diameter and faces sides of flange simultaneously at rate of 9 bushings per hour; the other finishes the bore at rate of 15 per hour. All dimensions are held to extremely narrow limits. Photo courtesy Ampco Metal Inc., Milwaukee

■ Fabricated by arc welding, this base for a sheet mill side trimmer (below) is 26 feet long, 3 feet wide, 2 feet high, and weighs 18,000 pounds. Observe the pleasing rounded corners. Plate thickness is 1/2-inch or over, and dimensions are held within 1/8-inch. All welds were peened and ground. The base was constructed by Manufacturers & Fabricators Inc., Elyria, O.



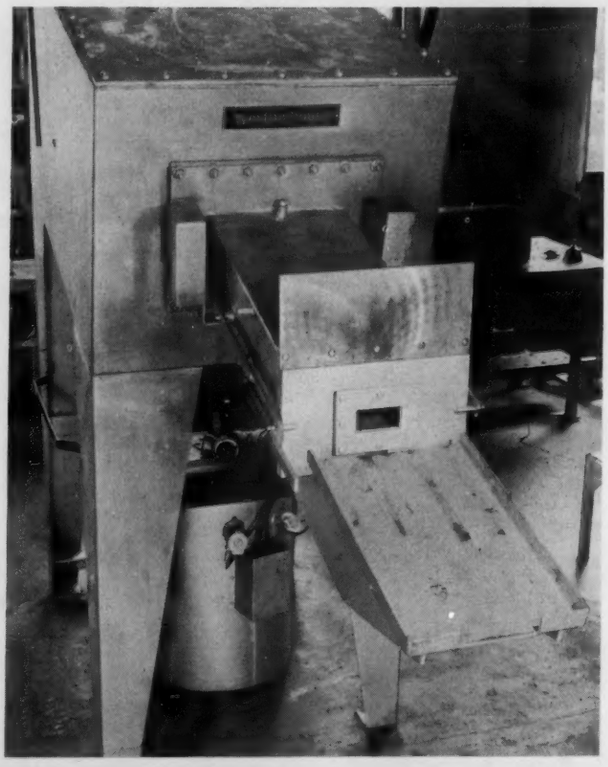
■ Shown below is a movable furnace and twin container unit built by Electric Furnace Co., Salem, O., for nitriding airplane engine parts. The furnace, of double-end type, travels lengthwise over a fixed hearth on which the two containers are placed. At the end of one heat, furnace is shifted to the second position over a loaded and purged container. Permanent gas connections eliminate flexible line. Control equipment for temperature and ammonia dissociation appears in foreground



Metals . . . .
PICTORIALLY SPEAKING

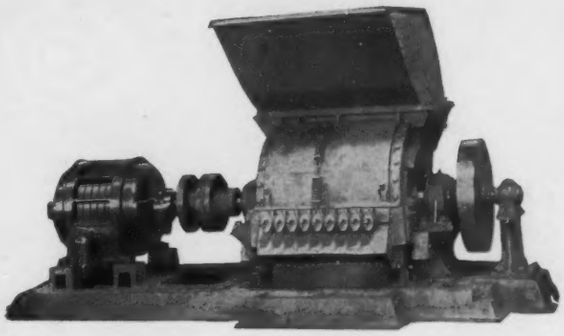
■ Oxidation, decarburization, distortion or cracking of tool steels are said to be eliminated through refinement of hardening methods, utilizing a new electric furnace (below) developed by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. An Ammogas atmosphere, so inactive with carbon that a skin does not form on steel, is the key to this success. Its composition needs no adjustment to requirements of the steel being hardened and its strongly reducing character aids in hardening of stainless steel without tarnish. Since the gas is lighter than air, furnace is tilted 20 degrees with entrance at low end

■ Welding is used increasingly in construction of machine tools and heavy machinery. The operator (above) is fabricating a coolant pan for a ram-type turret lathe by arc welding. Murex type F electrodes, manufactured by the Metal & Thermit Corp., New York, are being employed. These electrodes are heavily coated and designed for fast fillet welding and other downhand work



■ Measuring temperature of molten steel as it flows from ladle into ingot mold is accomplished with a new potentiometer-type optical pyrometer (below) developed by Leeds & Northrup Co., Philadelphia. Instrument has a range from 1400 to 5200 degrees Fahr. It is direct reading when measuring objects under black body conditions and uses the disappearing-filament method. Claimed to be the first potentiometer-type optical pyrometer for industrial use, it suggests numerous uses in steel plants

BIG RETURNS
ON A SMALL INVESTMENT



No. 3800 American Steel Turnings Crusher with hopper mounted on bed plate. (Patented)

Feed Platform with Steel Turnings

Many shops and manufacturing plants are making extra profits by crushing their turnings into chips with AMERICAN RING STEEL TURNING CRUSHERS. Chips not only bring a higher price but are easier to handle, require less storage space and are easier to ship.

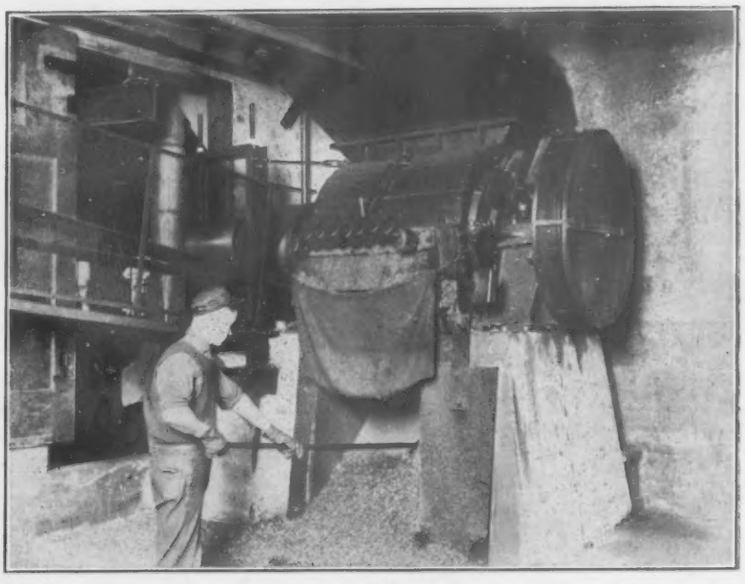
Your long turnings will cease to be a nuisance after you put an AMERICAN RING CRUSHER on the job. It will pay for itself in a very short time after which it will pay you a steady profit.

Do you want this EXTRA profit?

Write us for full particulars.

American Ring Crushers are crushing run of mine coal to stoker size at maintenance cost as low as 1/10 of a cent a ton

We manufacture a complete line of reduction equipment. Put your problems up to us.

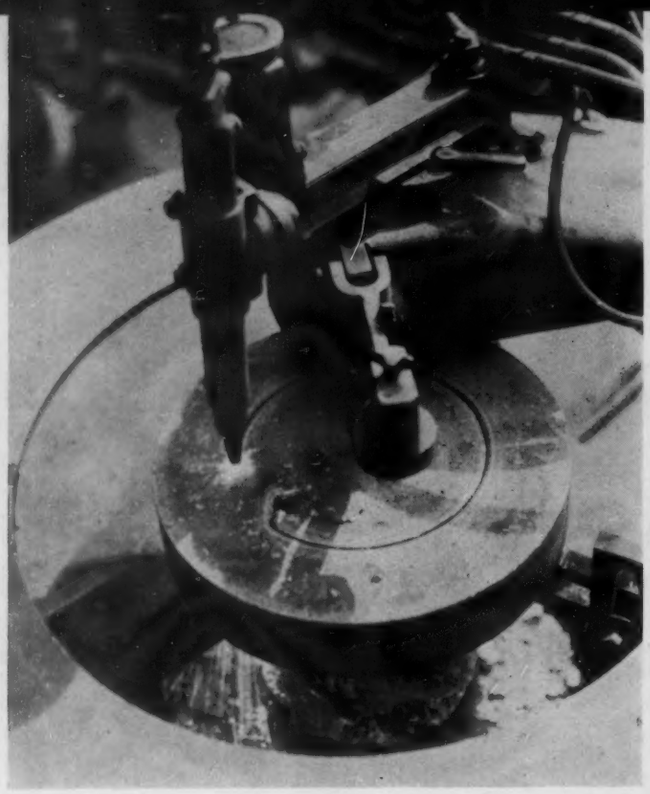


A Typical Installation

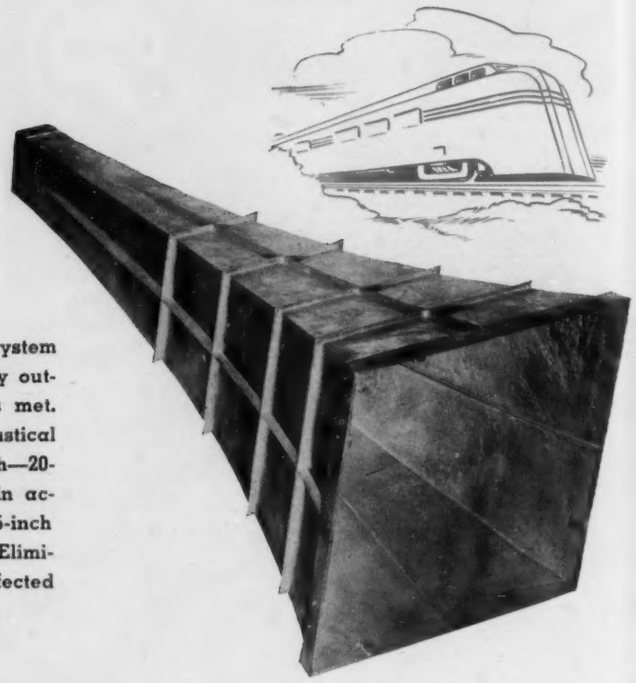
ORIGINATORS OF THE ROLLING RING CRUSHER PRINCIPLE

AMERICAN PULVERIZER CO.

1539 Macklind Ave., St. Louis, Mo.



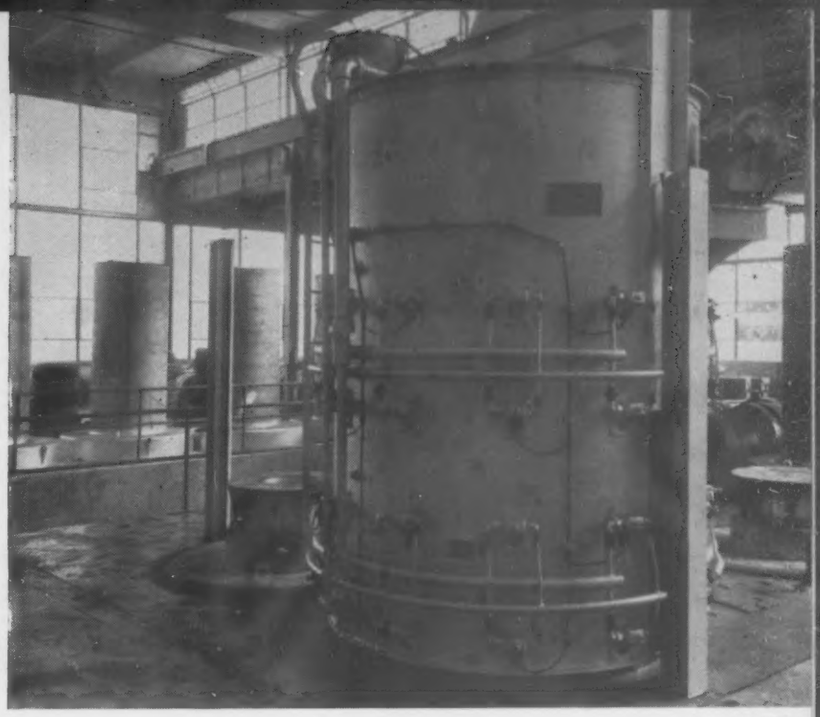
■ This portable oxyacetylene cutting machine (left) is fabricating a roll ring for a steel mill conveyor. Disks 14 inches diameter are first cut from 2½-inch plate, then a 9-inch diameter hole is cut out of the center. Inside diameters are machined and the rings shrunk-fit onto a shaft, next welded in place. The rolls, each having 11 of these rings, convey slabs from the bloomer to the hydraulic shear. Photo courtesy the Linde Air Products Co., New York



■ The loud speaker horn (right) for a public address system is a one-piece zinc alloy die casting. It is a particularly outstanding application because of stringent requirements met. First, accurate shape was essential to form a perfect acoustical path. Important dimensions were held within 0.002-inch—20-inch length within 0.030-inch. Second, part must maintain accurate shape in service. This was accomplished with 0.065-inch wall thickness. Finally, production cost had to be low. Eliminating costly machining and assembling operations effected this. Photo courtesy New Jersey Zinc Co., New York

■ Forming and drawing of magnesium alloy sheet is a recent development of the Dow Chemical Co., Midland, Mich. The aircraft wheel fairing, at left in illustration, is 43 inches diameter and was fabricated by hot spinning No. 8 gage sheet. At right is a large dust cover of same diameter and gage; and in center a smaller and lighter-gage dust cover—both were press drawn hot. Depth of draw is 4 inches and 2⅛ inches, respectively. Forming is best done hot at temperatures of 500 to 750 degrees Fahr., using heated dies

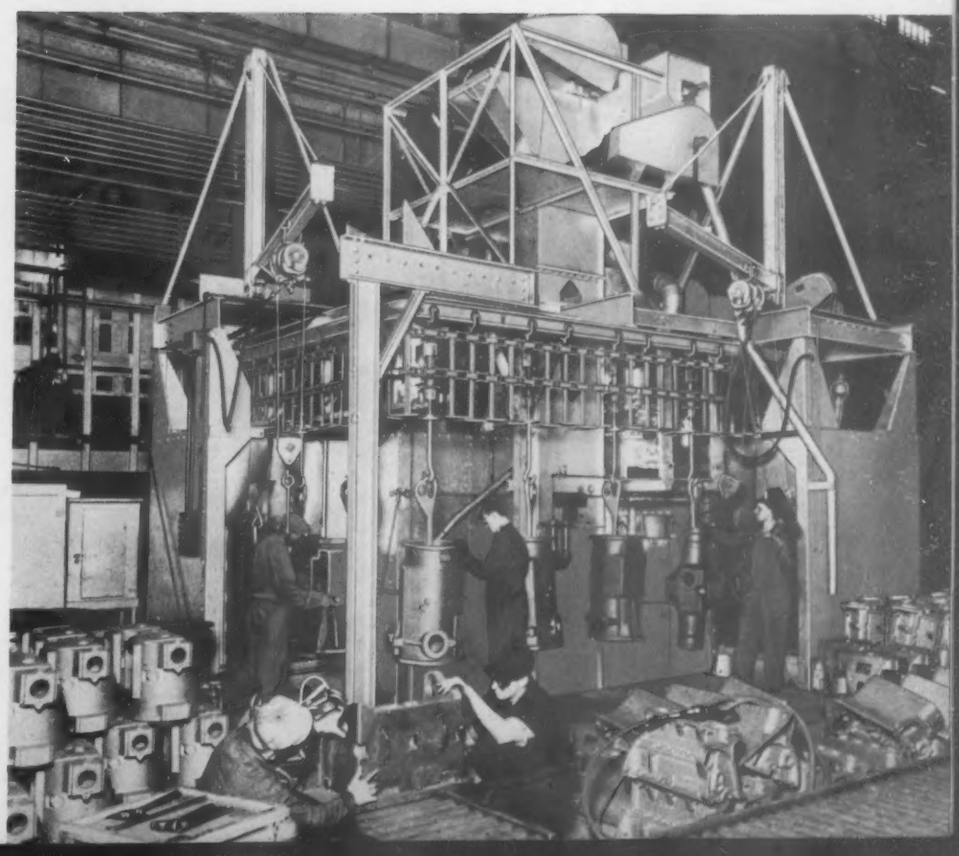
Metals . . . .
PICTORIALLY SPEAKING

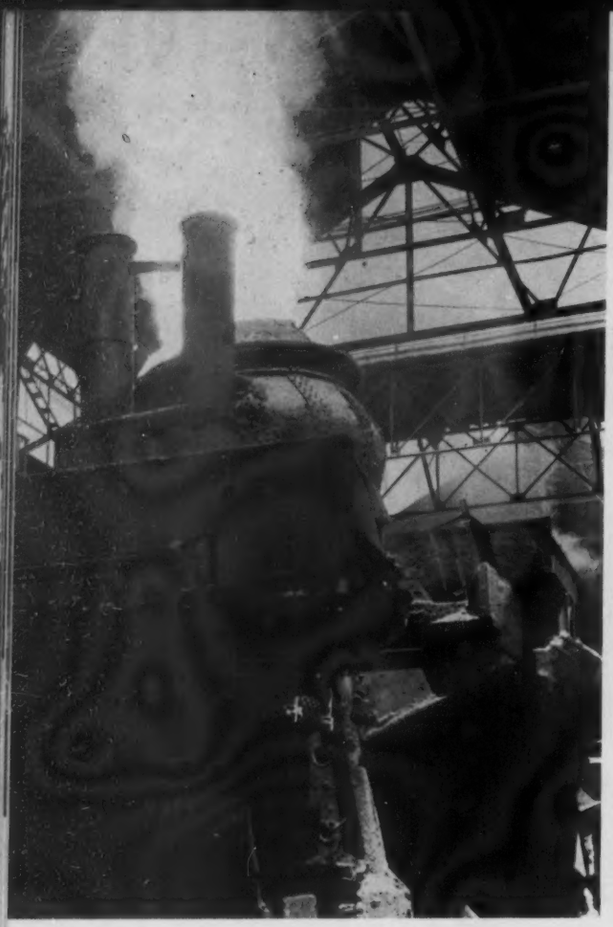


■ A new radiation-convection principle of burner application features this "Top Hat" bell-type, lifting-cover annealing furnace (right) designed by Continental Industrial Engineers Inc., Chicago, to give extreme temperature uniformity and high temperature. A continuous radiant wall surrounding the material is provided with adjustments for temperature and heat input at any horizontal plane. Temperature variation of less than 5 degrees Fahr. in all parts of the metal is said to be held readily

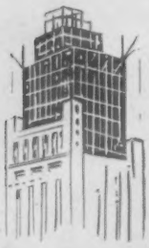
■ How low-alloy, high-tensile steels contribute to elimination of deadweight and reduce operating and maintenance costs is illustrated in the public utility truck body (left) built by H. Kaiser & Co., Philadelphia, for Philadelphia Rapid Transit Co. With bulkheads, gussets, superstructure and base fabricated from "A. W" Dyn-el steel manufactured by Alan Wood Steel Co., Conshohocken, Pa., road weight of the body is 4235 pounds, or 2965 pounds less than conventional type. It has 47 per cent more space

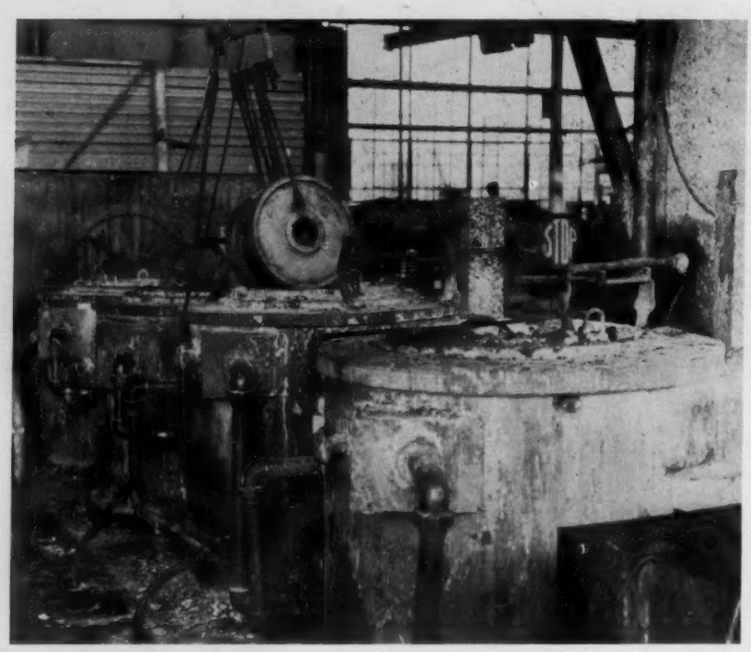
■ A large midwestern manufacturer cleans tractor engine cylinder blocks in this specially-designed cabinet (right) employing the Wheelabrator airless abrasive blasting principle. The machine, built by the American Foundry Equipment Co., Mishawaka, Ind., is equipped with four blast units set at different positions and angles. Blocks move through the cabinet on a special monorail conveyor which spin and turn them as they approach the blasting zones. In this way, every nook, corner and crevice is completely scoured and cleaned



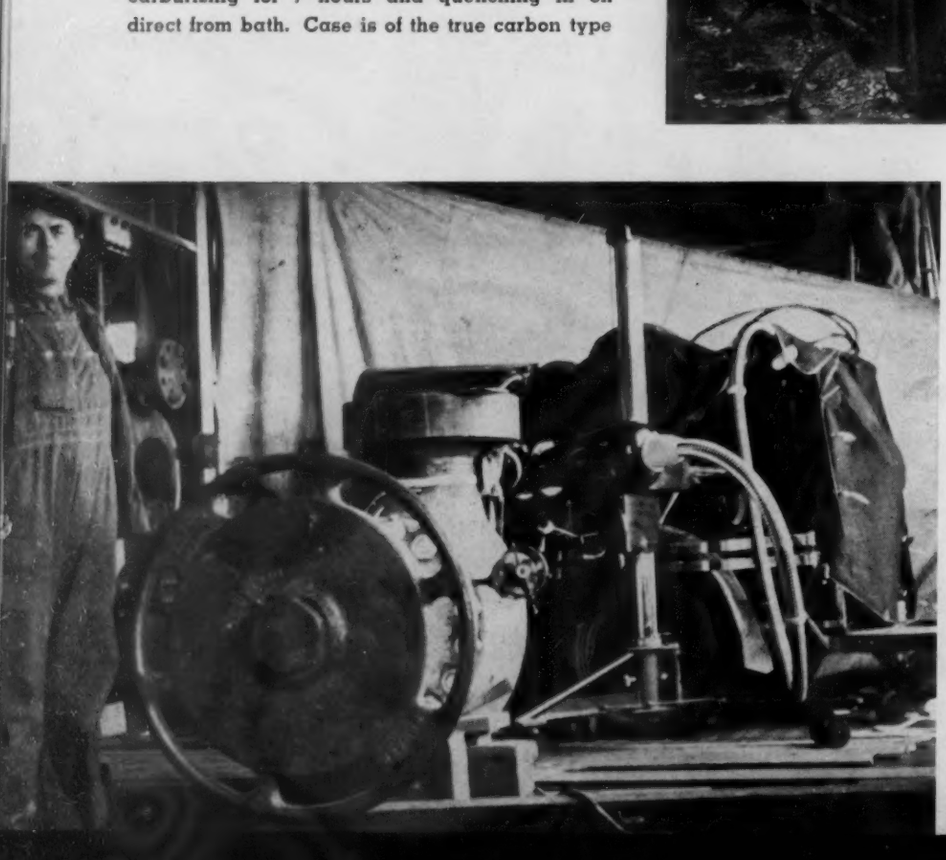


■ A method for controlling uniformity of quality in bessemer steel, an objective long sought, was announced during this year by Jones & Laughlin Steel Corp., Pittsburgh, following exhaustive tests. The method, known as "bessemer flame control," makes use of photo-electric cells and auxiliary devices to provide accurate regulation of blowing conditions. It operates with split-second speed and without variables of the human eye. Until now, control of the bessemer converter (left) depended upon the skilled eyes of the blower, who had sole responsibility in determining the proper "end point" or termination of the blow, which has a definite connection with quality results





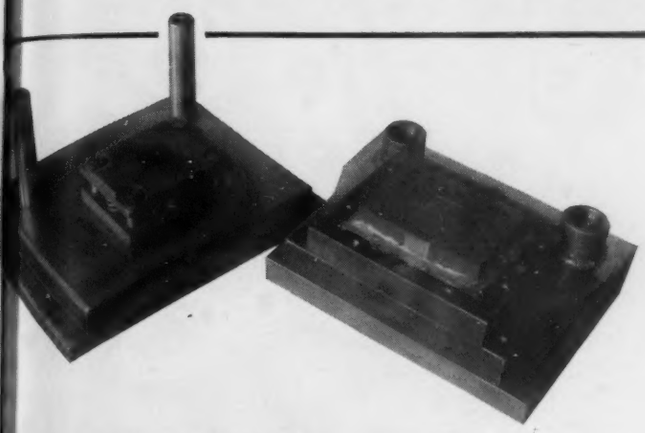
■ Shown at right is a battery of automatically-controlled, gas-fired gear carburizing furnaces operating at 1650 degrees Fahr. and using Perliton liquid carburizer, made by E. F. Houghton & Co., Philadelphia, as the medium. Large gears used in road building machinery, 38½ inches diameter, 8 inches thick and weighing about 700 pounds, are given a 0.062-inch case by carburizing for 7 hours and quenching in oil direct from bath. Case is of the true carbon type

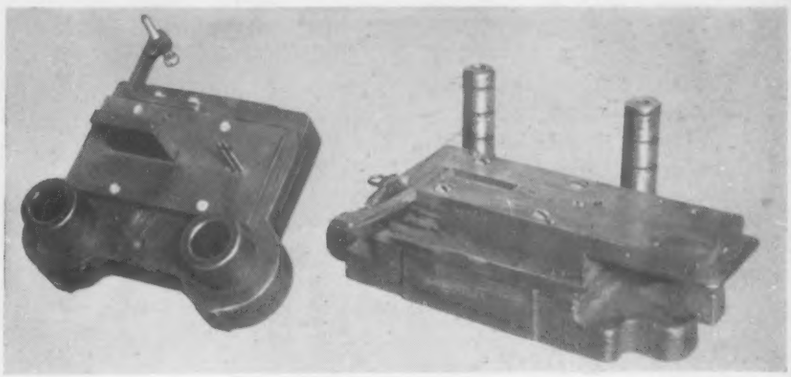


■ X-ray equipment of St. John X-Ray Service Inc., Long Island City, N. Y., set up for inspection of a valve body is shown at left. The heavy flange was welded on the casting; X-ray tube is in place for examining joint. Latest development is a line-focus tube with extremely fine focal spot permitting detection of defects as small as 0.5 per cent of the cross-section on steel 2 inches thick; 1.0 per cent between 2 and 3 inches

NEW WESTINGHOUSE FURNACE BRIGHT HARDENS DIE BLOCKS

Without Oxidation, Decarburization, Distortion or Cracking





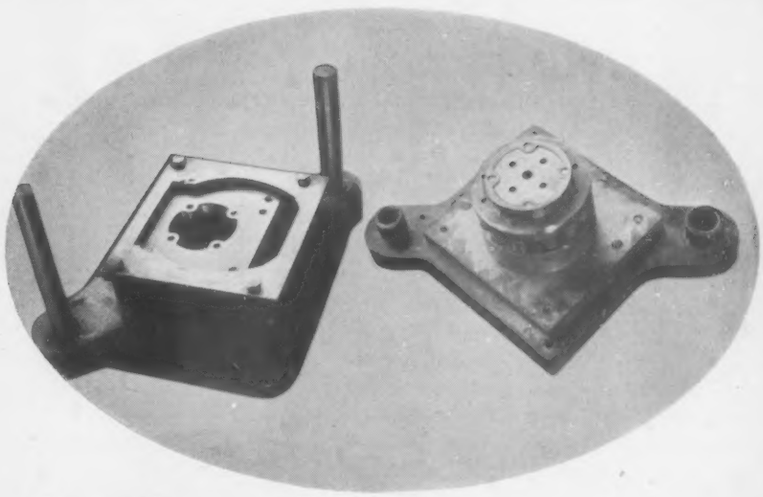
xpensive Grinding and inishing Operations Eliminated

as always been an accepted fact that damage to die cks during hardening can not be avoided. This is y an old idea. Damage *can* be avoided. Die blocks can bright hardened without oxidation, decarburization, tortion or cracking. Dies can be produced without pensive grinding or finishing operations. Production ts can be reduced without any loss in precision quality.

Westinghouse research has revealed the causes of mage to die blocks during hardening. Westinghouse gineers have designed a furnace that eliminates these uses.

The new electric furnace is of entirely different conruction and design to permit the use of a newly veloped atmosphere, "Ammogas." Heated by this new ctric furnace in Westinghouse Ammogas, die blocks rden with bright, clean, smooth surfaces.

Wherever dies are hardened, this new furnace can cut duction costs. For full information see your Westinguse representative, or write direct. Westinghouse ctric & Mfg. Co., East Pittsburgh, Pa.



An outstanding advantage of Ammogas hardening is the complete assurance that a die set will come from the hardening room in a serviceable condition. The die sets illustrated here are typical of more than 300 punches, dies and other tools hardened for production departments during the past 28 months.

J-10154

See the new WESTINGHOUSE FURNACE On Display CHICAGO METAL SHOW Oct. 23-27 • Booth B-125

Westinghouse

Complete Heat Treating Equipment

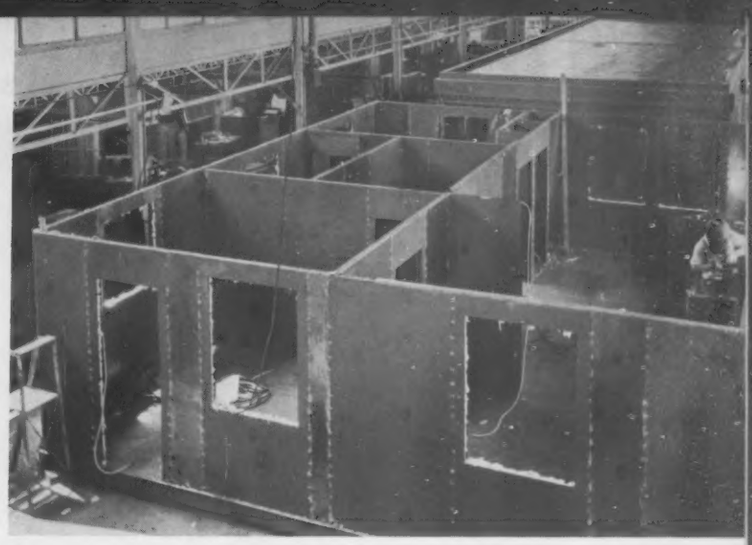
■ For anodic pickling and iron plating of alloy insert material used in production of its stainless clad and other composite steels, Jessop Steel Co., Washington, Pa., recently installed the tanks shown above. Purpose of the process, a patented one, is to remove all oxides from the alloy surface, thus assuring a complete tenacious backing when the composite sheets or plates are later rolled

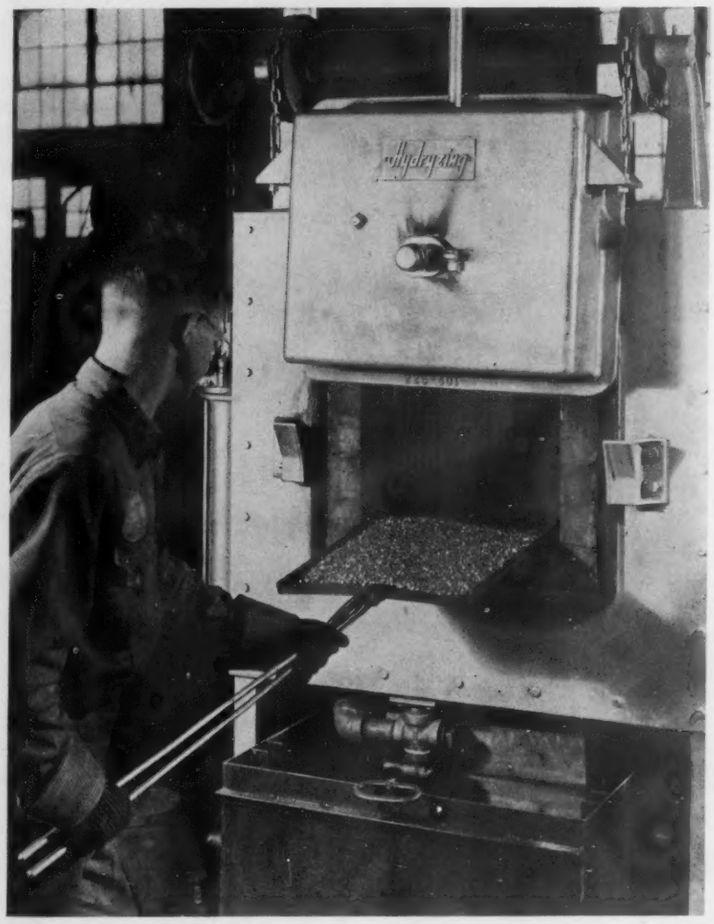
■ Observe the mirror polish on the stainless steel sheet (right), 48 inches wide and 120 inches long, produced in the Wood Works, Carnegie-Illinois Steel Corp., McKeesport, Pa. The sheet was hot rolled, annealed at high temperature, pickled or descaled, cold rolled to high luster, reannealed, repickled, ground to remove surface imperfections, and polished with emery abrasive to high luster

■ The operator (left) is shown simultaneously seam welding top and bottom to a refrigerator inner liner, using a special two-roll series liner welder built by National Electric Welding Machines Co., Bay City, Mich. Machine is equipped with hydraulically-operated, mechanically-indexed, traveling work holding and clamping fixture, with air-operated wrap-around clamps, eliminating tack welding. One operator handling two machines can weld 100 liners per hour; one operator with one machine, 60 per hour. Seams require no finishing prior to porcelain enameling

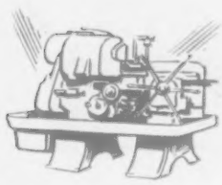
Metals . . . .
PICTORIALLY SPEAKING

■ Bright hardening of small and medium size batches is definitely new, equipment up to now having been of large, continuous conveyor type. Illustration below shows a Hydryzing furnace built for this purpose by Lindberg Engineering Co., Chicago. This unit is 15 inches wide, 30 inches deep and 12 inches high, is electrically heated and has a temperature range to 2000 degrees Fahr. Parts are quenched directly from the chamber into oil by a chute. Size of work varies from watch parts such as sprockets 1/8-inch diameter up to heavy springs, stampings and forgings

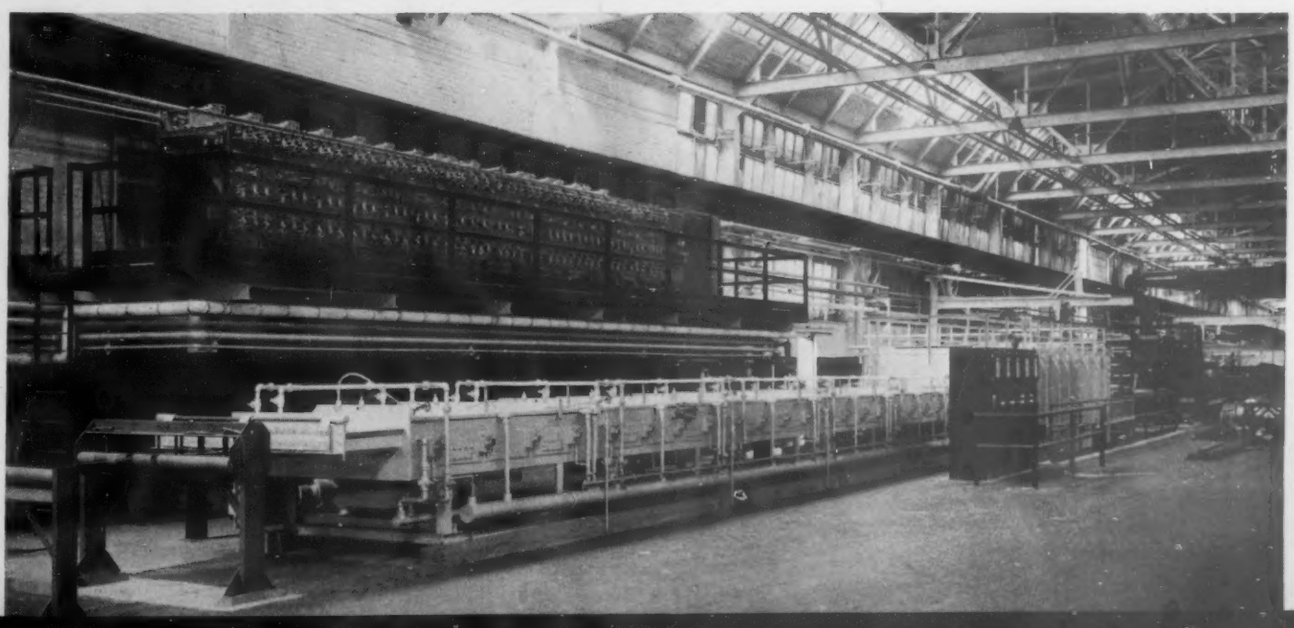




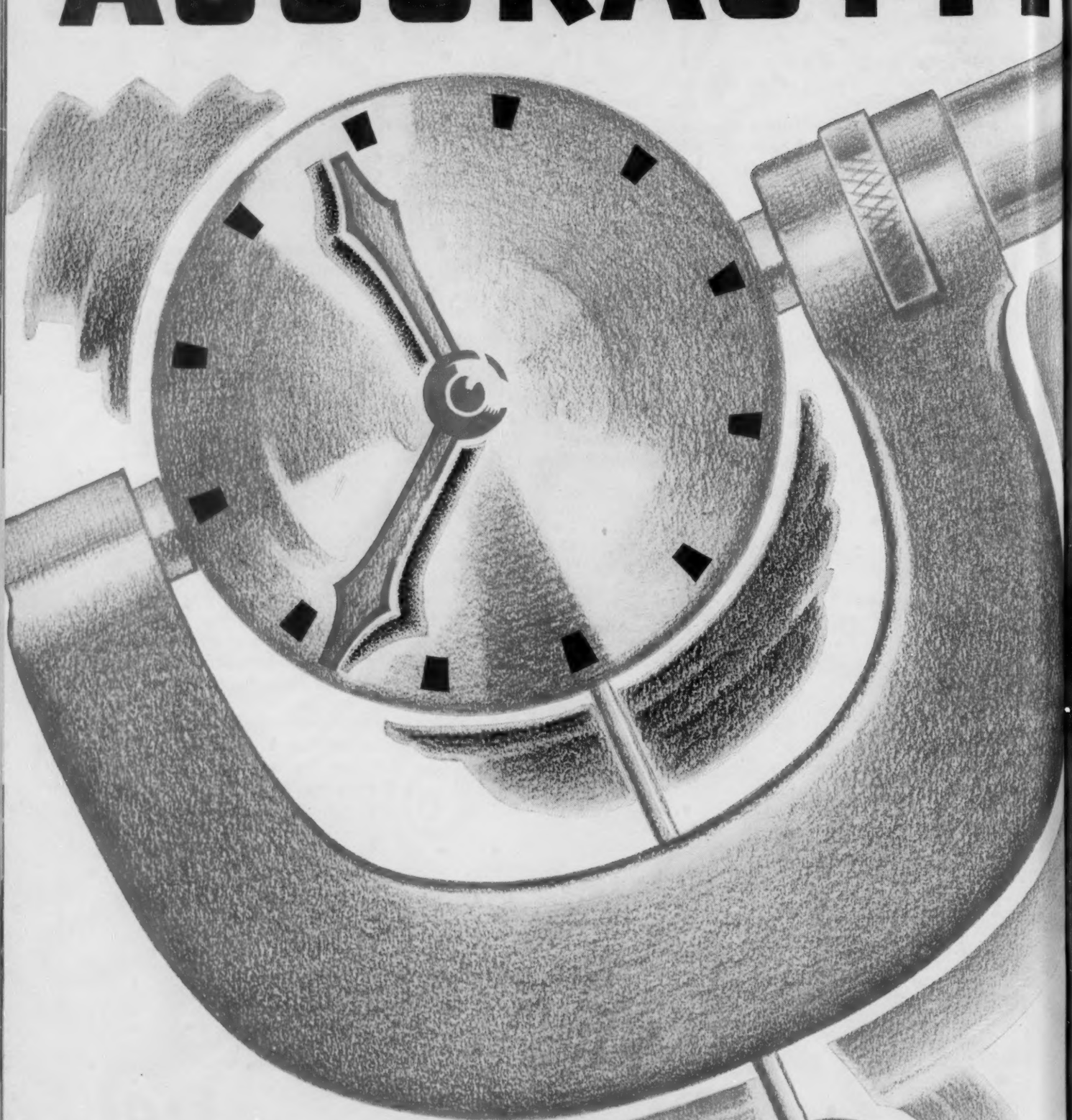
■ Attractive arc welded steel houses are fabricated from floor to roof on a full line production schedule in the plant of Hobart Bros. Co., Troy, O. One of these houses (above) uses 22 tons of steel, mostly of 18-gage, with floors of 11-gage. Special machines cut and form the various pieces ready for welding. As houses leave the factory, they are ready for occupancy with all equipment built-in or installed



■ Illustrated below is a catenary-type electric furnace built by General Electric Co., Schenectady, N. Y., for normalizing steel strip. The strip is supported on two rolls, one at each end, outside the heating chamber, thus hangs in a free catenary and is untouched in the high temperature zone. The furnace has Reactrol temperature control which through thyratron vacuum tubes provides graduated power input with smooth regulation. It is instantly responsive to temperature change. Electrical rating is 460 kilowatts



ACCURACY...



BULLARD **BULLARD**

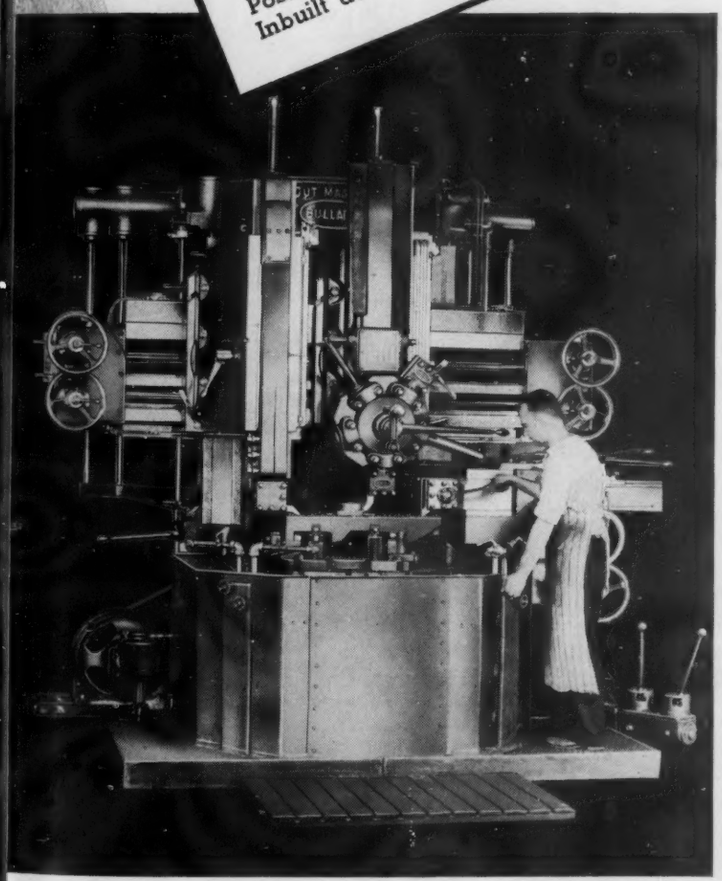
. . LESS TIME

CUT MASTER
Cuts Time . . .

16 feeds: .0026" to .500"
20 table speeds
Sufficient power for carbide tools
Power traverse of all heads

CUT MASTER
Increases Accuracy

Heavy Timken Bearing Spindles
Screw feeds in all directions
Positive pressure lubrication
Inbuilt accuracy through rigidity



● CUTS TIME ON CUTS—Cut Master's heavy rigid frame and power at point of cutting develops the full potential of modern tungsten carbide tools. Three heads (except on 30" and 36" models) each with complete, independent feed works naturally lower the production times of two head turret lathes.

● CUTS TIME BETWEEN CUTS—Cut Master has a speedy indexing turret, and provision for rapid power traverse in all directions on all heads and rams. This, combined with the fact that work operations may be laid out so that two heads are cutting while change of operation is being made on the third head cuts idle time to the minimum. Centralized and interlocking control throughout provides added speed of operation and protects the machine.

● INCREASED AND SUSTAINED ACCURACY—Its massive roller bearing spindle resists wear even under high speeds and the heaviest cuts. Screw feeds in all directions in main heads give new smoothness in feeds and finished work. Electric stops guarantee protection and assist in size control whenever duplicating dimensions. Send for new bulletin giving complete data on all sizes —30", 36", 42", 54", 64".

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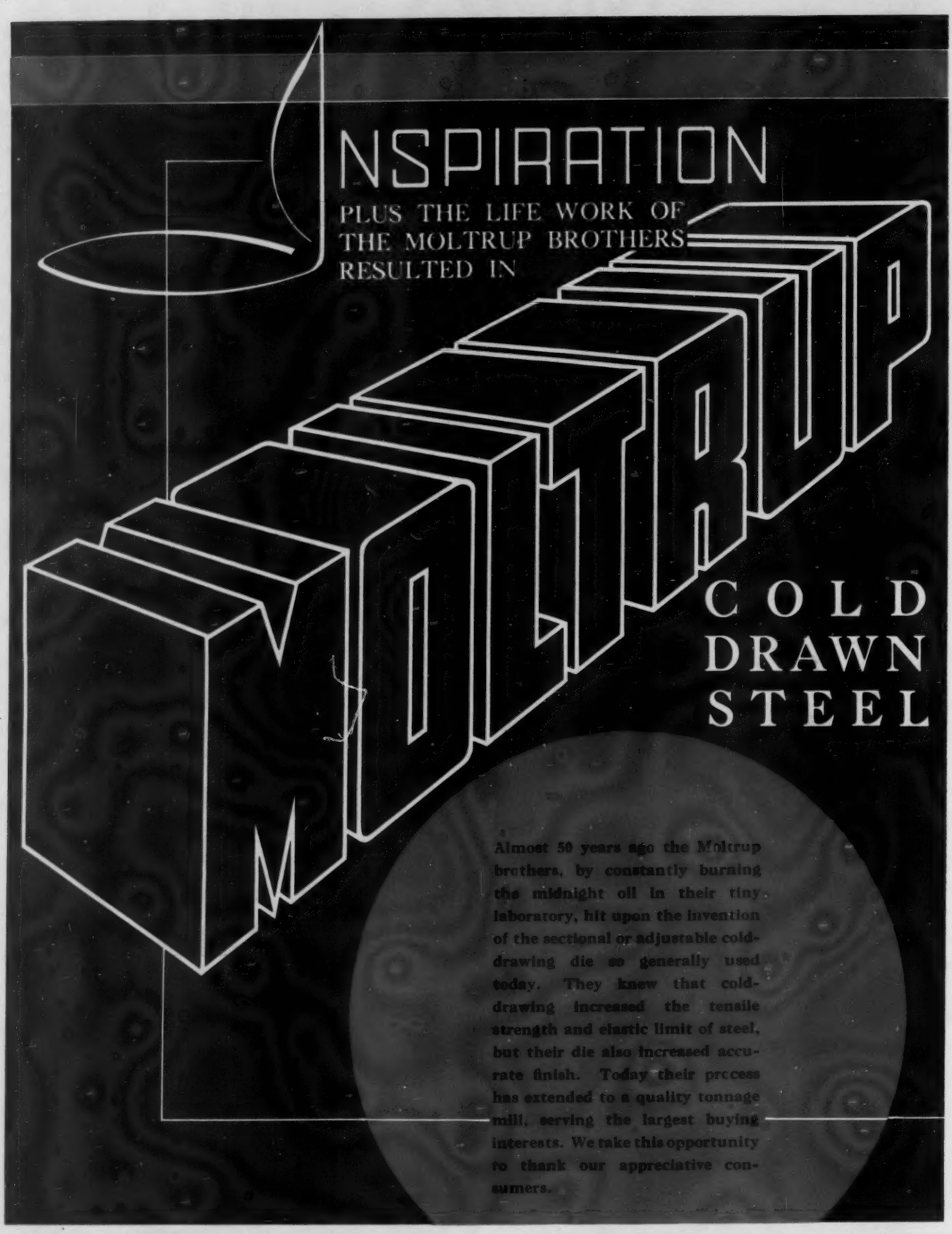
You must see Cut Master to really understand and appreciate what its many features mean in actual operation. You are cordially invited to visit our plant in Bridgeport where the 30", 42", and 64" machines are set up for demonstration.

CUT MASTER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Almost 50 years ago the Moltrup brothers, by constantly burning the midnight oil in their tiny laboratory, hit upon the invention of the sectional or adjustable cold-drawing die so generally used today. They knew that cold-drawing increased the tensile strength and elastic limit of steel, but their die also increased accurate finish. Today their process has extended to a quality tonnage mill, serving the largest buying interests. We take this opportunity to thank our appreciative consumers.
MOLTRUP STEEL PRODUCTS CO.
BEAVER FALLS, PA.

Simultaneous Sessions, Precipitation Hardening Symposium and Two Educational Courses Headline Five-Day Schedule

Monday, Oct. 23

9:30 A. M.—PALMER HOUSE

"Impact Properties of Some Low Alloy Nickel Steels at Temperatures Down to —200 Degrees Fahr.," by T. N. Armstrong and A. P. Gagnebin, International Nickel Co. Inc., New York.

"Effect of Titanium on Macrostructure and Grain-Coarsening Temperature of Forging Steel," by G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

"Introductory Study of the Nitriding of Hardened High Speed Steel by Use of Molten Cyanides," by J. G. Morrison, Landis Machine Co., Waynesboro, Pa., and J. P. Gill, Vanadium-Alloys Steel Co., Latrobe, Pa.

"Some Practical Notes on High Speed Steel Forgings," by W. H. Wills, Allegheny Ludlum Steel Corp., Dunkirk, N. Y.

9:30 A. M.—PALMER HOUSE

"Stress-Strain Characteristics of the Torsion Impact Test," by O. V. Greene and R. D. Stout, Carpenter Steel Co., Reading, Pa.

"Influence of Magnetic Fields on Damping Capacity," by E. R. Parker, General Electric Co., Schenectady, N. Y.

"Interrelation Between Stress and Strain in the Tensile Test," by E. J. Janitzky and M. Baeyertz, Carnegie-Illinois Steel Corp., Chicago.

"Fatigue Resistance of Steel as Affected by Acid Pickling," by G. L. Kehl, United States Steel Corp., Pittsburgh, and C. M. Offenhauer, Lehigh university, Bethlehem, Pa.

2:00 P. M.—INTERNATIONAL AMPHITHEATRE

"Creep Rates from Tests of Short Duration," by J. J. Kanter and E. A. Sticha, Crane Co., Chicago.

"Characteristics of 5 and 7 Per Cent Chromium Steels with Varying Molybdenum and Vanadium Content," by W. G. Hildorf, Timken Roller Bearing Co., Canton, O., and C. L. Clark and A. E. White, University of Michigan, Ann Arbor, Mich.

"Stress Corrosion Cracking of Austenitic Chromium-Nickel Steels and Its Industrial Implications," by J. C. Hodge, Babcock & Wilcox Co., Barberton, Pa., and J. L. Miller, Armour Institute of Technology, Chicago.

"Ferromagnetic Austenite," by L. P. Tarasov and E. R. Parker, General Electric Co., Schenectady, N. Y.

4:30 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

"Functions of the Alloying Elements in Steel," lecture I, by E. C. Bain, United States Steel Corp., Pittsburgh.

8:00 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

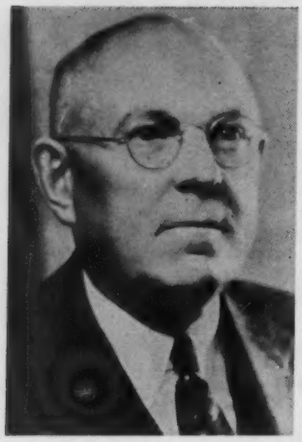
"Visual Examination of Steels—Macroscopic Technique," lecture No. 1, by G. M. Enos, University of Cincinnati, Cincinnati.

Tuesday, Oct. 24

9:30 A. M.—PALMER HOUSE

"An Analysis of Machinability Data from Cold Finished and Heat treated S. A. E. 1045 Steel," by O. W. Boston and W. W. Gilbert, University of Michigan, Ann Arbor, Mich.

"A Discussion of the Leaded Steels," by F. J. Robbins



William P. Woodside

President, American Society for Metals. He is vice president of the Climax Molybdenum Co., Detroit

James P. Gill

Vice president, American Society for Metals. He is chief metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa.

and G. R. Caskey, Bliss & Laughlin Inc., Harvey, Ill.

"Precipitation Hardening Characteristics of High-Purity Aluminum-Copper and Aluminum-Copper-Iron Alloys," by H. Y. Hunsicker, Aluminum Co. of America, Cleveland.

"Drawing of Aluminum," by L. J. Weber and J. T. Weinzierl, Aluminum Cooking Utensil Co., New Kensington, Pa.

9:30 A. M.—PALMER HOUSE

"Annealing of Low-Carbon Rimmed, Aluminum-Killed and Silicon-Killed Steels," by W. P. Wallace, Columbia Steel Co., Torrance, Calif., and R. L. Rickett, United States Steel Corp., Kearny, N. J.

"Prevention of Flakes by Holding Railroad Rails at Various Constant Temperatures," by R. E. Cramer and E. C. Bast, University of Illinois, Urbana, Ill.

"Selection of Steel and Heat Treatment for Spur Gears," by H. B. Knowlton and E. H. Snyder, International Harvester Co., Chicago, Ill.

2:00 P. M.—INTERNATIONAL AMPHITHEATRE

"Time Quenching," by J. L. Burns and Victor Brown, Republic Steel Corp., Chicago.

"A Test Method for Evaluation of Aqueous Quenching Media for Steel Hardening," by F. W. Trembour and Howard Scott, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Hardenability Variations in Alloy Steels: Some Investigations with the End-Quench Test," by G. T. Williams, Deere & Co., Moline, Ill.

"A Hardenability Test for Shallow-Hardening Steels," by W. E. Jominy, General Motors Corp., Detroit.

4:30 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

"Functions of the Alloying Elements in Steel," lecture II, by E. C. Bain, United States Steel Corp., Pittsburgh.

8:00 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

"Visual Examinations of Steels—Macro Etching," lecture No. 2, by G. M. Enos, University of Cincinnati, Cincinnati.

Wednesday, Oct. 25

9:30 A. M.—PALMER HOUSE

Annual Meeting

Reports of officers and election of officers.

Edward De Mille Campbell Memorial lecture: "Isothermal Transformation in Steel," by E. S. Davenport, United States Steel Corp., Kearny, N. J.

"Effect of Hardness and Temperature on Strength, Ductility and Toughness of a Heat Treated Carbon Steel," by S. W. Lyon, University of Illinois, Urbana, Ill.

"Hardness Characteristics of Some Medium Carbon S. A. E. Steels," by P. Klain and C. H. Lorig, Battelle Memorial institute, Columbus, O.

"Accelerating Effect of Certain Metallic Elements on Graphitization," by H. A. Schwartz, V. Fiordalis, J. L. Fisher, J. F. Shumar and M. J. Trinter, National Malleable & Steel Castings Co., Cleveland.

2:00 P. M.—INTERNATIONAL AMPHITHEATRE

"Transformation of Austenite on Quenching High-Purity Iron-Carbon Alloys," by T. G. Digges, national bureau of standards, Washington.

"Kinetics of the Austenite-Martensite Transformation in Steel," by A. B. Greninger and A. R. Troiano, Harvard university, Cambridge, Mass.

"Mechanical Properties of the Isothermal Decomposition Products of Austenite," by M. Gensamer, E. B. Pearsall and G. V. Smith, Carnegie Institute of Technology, Pittsburgh.

"Spheroidizing of Steel by Isothermal Transformation," by P. Payson, W. Hodapp and J. Leeder, Crucible Steel Co. of America, Harrison, N. J.

4:30 P. M.—INTERNATIONAL AMPHITHEATRE

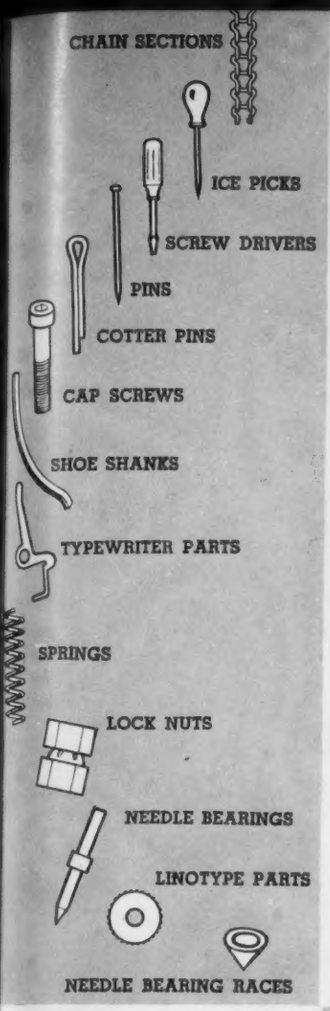
Educational Lecture

"Functions of the Alloying Elements in Steel," lecture III, by E. C. Bain, United States Steel Corp., Pittsburgh.

8:00 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

"Visual Examination of Steels—Other Methods of



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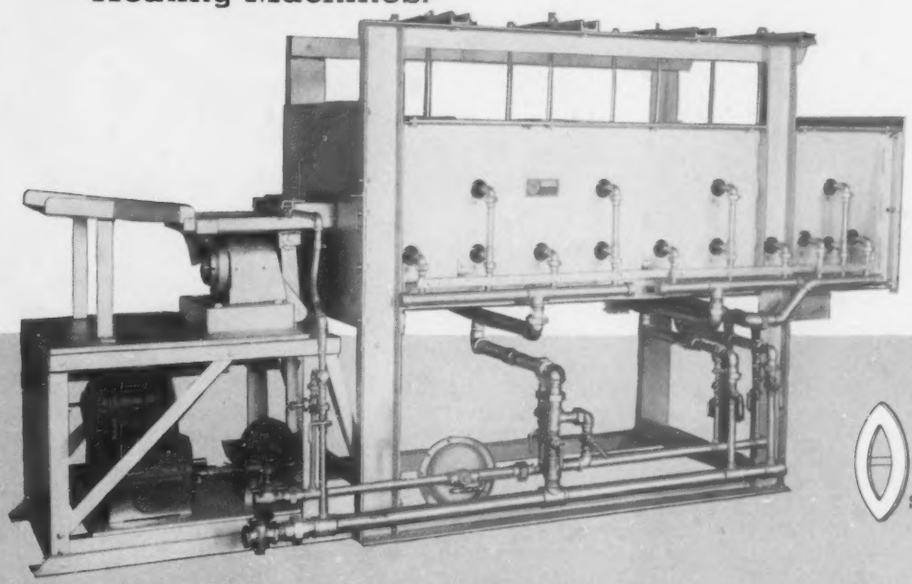
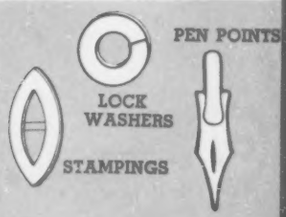


why?



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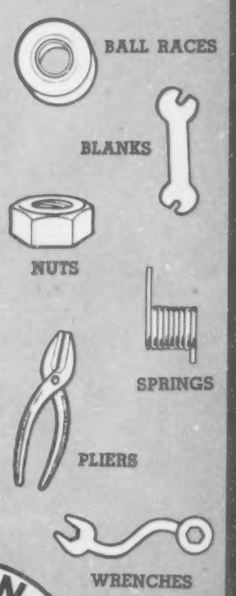

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Edmund S. Davenport

1939 Campbell Memorial lecturer. He is metallurgist, research laboratory, United States Steel Corp., Kearny, N. J.

William H. Eisenman

Secretary, American Society for Metals, Cleveland. He is also general manager of the National Metal Exposition

Testing," lecture No. 3, by G. M. Enos, University of Cincinnati, Cincinnati.

Thursday, Oct. 26

9:30 A. M.—PALMER HOUSE

"Bright Hardening of Tool Steels Without Decarburization or Distortion," by J. R. Gier and Howard Scott, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Hardness Conversion Relations for Hardened Steels," by Howard Scott and T. H. Gray, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Hardenability Studies on Tool Steels," by A. J. Scheid Jr., Columbia Tool Steel Co., Chicago Heights, Ill.

9:30 A. M.—PALMER HOUSE

"Nickel-Tungsten System," by F. H. Ellinger and W. P. Sykes, General Electric Co., Cleveland.

"Effect of Humidity of Air on Oxidation of a Low Carbon Steel," by C. A. Siebert, University of Michigan, Ann Arbor, Mich., and H. G. Donnelly, Wayne university, Detroit.

"Heat Etching as a Means of Revealing Austenite Grain Size," by M. J. Day and J. B. Austin, United States Steel Corp., Kearny, N. J.

"Tempering of High Speed Steels," by Morris Cohen and P. K. Koh, Massachusetts Institute of Tecchnology, Cambridge, Mass.

2:00 P. M.—INTERNATIONAL AMPHITHEATRE

Symposium on Precipitation Hardening (Age Hardening) of Metals

"Introduction to Precipitation Hardening," by Zay Jeffries, General Electric Co., Cleveland.

"Application of Solid Solution and Precipitation Hardening Effects in Aluminum Alloys," by L. W. Kempf, Aluminum Co. of America, Cleveland.

"Precipitation Hardening of High-Purity Binary and Ternary Aluminum-Copper Alloys," by W. L. Fink, D. W. Smith and L. A. Willey, Aluminum Co. of America, New Kensington, Pa.

"Precipitation Hardening in the Heavy Alloys," by W. P. Sykes, General Electric Co., Cleveland.

4:30 P. M.—INTERNATIONAL AMPHITHEATRE

Educational Lecture

"Functions of the Alloying Elements in Steel," lecture IV, by E. C. Bain, United States Steel Corp., Pittsburgh.

7:00 P. M.—PALMER HOUSE

Annual banquet. Speaker: R. E. Desvernine, president, Crucible Steel Co. of America, New York.

Friday, Oct. 27

8:30 A. M.—PALMER HOUSE

Educational Lecture

"Functions of the Alloying Elements in Steel," lecture V, by E. C. Bain, United States Steel Corp., Pittsburgh.

9:30 A. M.—PALMER HOUSE

Symposium on Precipitation Hardening (Age Hardening) of Metals

"Age-Hardening Copper Alloys," by D. K. Crampton, Chase Brass & Copper Co., Waterbury, Conn.

"Age Hardening of a Copper-Cobalt and a Copper-Iron Alloy," by R. B. Gordon, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and M. Cohen, Massachusetts Institute of Technology, Cambridge, Mass.

"Age Hardening Precious Metal Alloys," by R. F. Vines and E. M. Wise, International Nickel Co. Inc., Bayonne, N. J.

"Dispersion Hardening Alloys of Nickel and Iron-Nickel-Titanium," by N. B. Pilling and A. M. Talbot, International Nickel Co. Inc., Bayonne, N. J.

"Aging in Iron and Steel," by R. L. Kenyon and R. S. Burns, American Rolling Mill Co., Middletown, O.

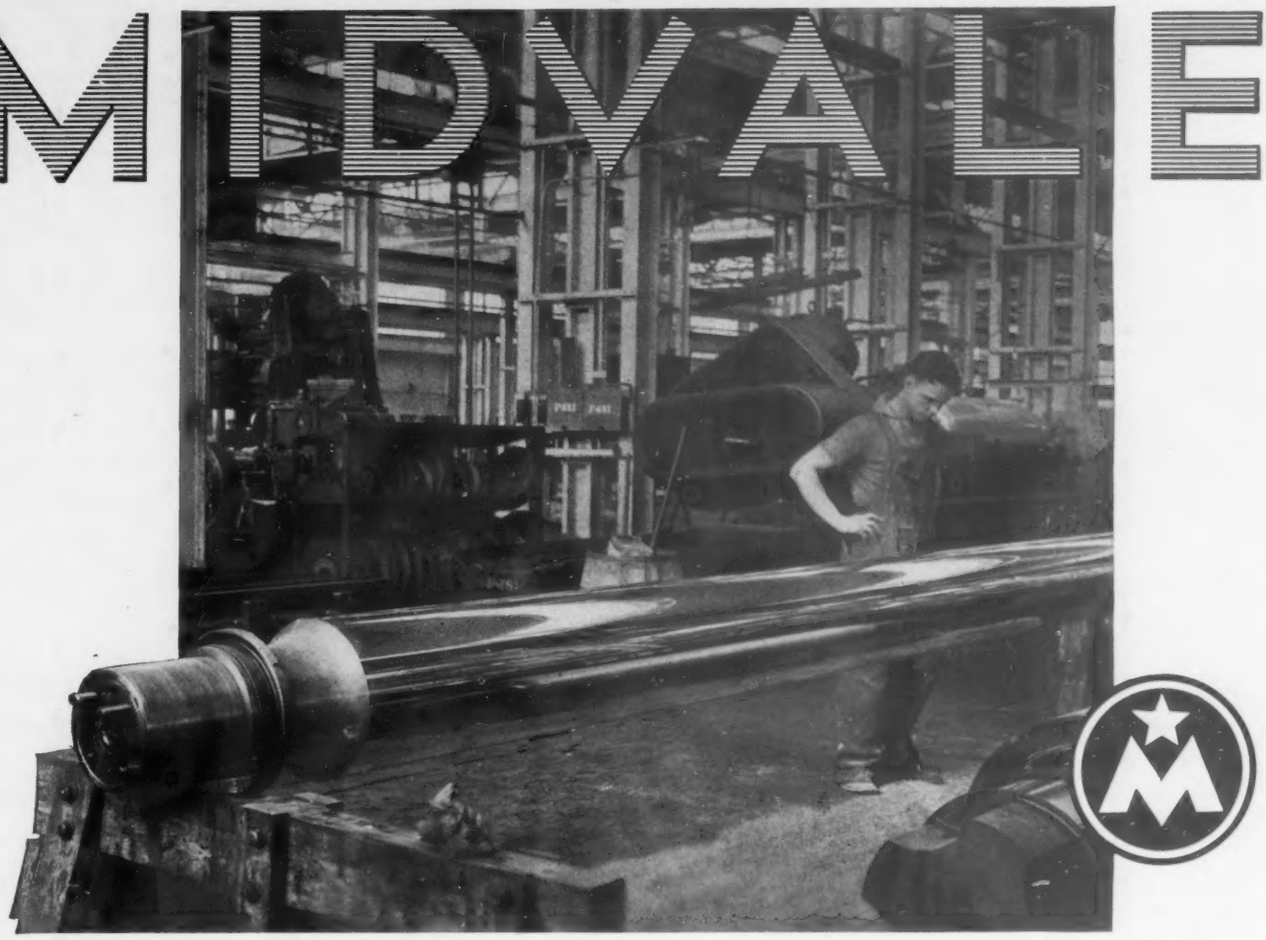
2:00 P. M.—INTERNATIONAL AMPHITHEATRE

Symposium on Precipitation Hardening (Age Hardening) of Metals

"Role of Strain in Precipitation Reactions in Alloys," by R. H. Harrington, General Electric Co., Schenectady, N. Y.

"Mechanism of Precipitation from Solid Solution. Theory of Age Hardening," by R. F. Mehl and L. K. Jetter, Carnegie Institute of Technology, Pittsburgh.

MIDVALE



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Monday, Oct. 23

9:30 A. M.—Stevens Hotel

Keynote address by David Levinger, Western Electric Co., Chicago. Presentation of medals.

Government Construction Work

"Welded Structures Under Bureau of Yards and Docks, United States Navy," by Com. C. A. Trexel, bureau of yards and docks, navy department, Washington.

"Bonneville Dam Presents Varied Use of Welding," by Paul L. Heslop and Fred T. Downing, corps of engineers, United States army, Bonneville, Oreg.

2:00 P. M.—Stevens Hotel

Industrial Research

"Weld Hardening of Carbon and Alloy Steels," by H. J. French and T. N. Armstrong, International Nickel Co. Inc., New York.

"An Investigation of Spot Welding of Automobile Grade Mild Steel," by W. F. Hess and R. A. Wyant, Rensselaer Polytechnic institute.

"Failure of Aluminum Subjected to Combined Stresses," by Joseph Marin, Rutgers university, New Brunswick, N. J.

"Fatigue Tests of Welded Joints in Structural Plates," by W. M. Wilson and A. B. Wilder, University of Illinois, Urbana, Ill.

2:00 P. M.—Stevens Hotel

Production Welding in Light-Gage Material

"Welding Propeller Shaft Tubing for the Automotive Industry," by G. C. Gridley, Mechanics Universal Joint Division, Borg-Warner Corp., Rockford, Ill.

"Automatic Gas Welding of Oil Float Assemblies," by H. E. Lerner, Taylor Sales Engineering Co., Elkhart, Ind.

"Brazing Methods for Aluminum Alloys," by G. O. Hoglund, Aluminum Co. of America, New Kensington, Pa.

7:30 P. M.—Stevens Hotel

Industrial research conference.

Tuesday, Oct. 24

9:30 A. M.—Stevens Hotel

Fundamental Research

"Reactions in Arc Welding," by R. D. Thomas Jr., Arcos Corp., Philadelphia, and F. H. Rhodes, Cornell university, Ithaca, N. Y.

"Arc Welding in Controlled Atmospheres," by G. E. Doan, Lehigh university, Bethlehem, Pa., and M. C. Smith, University of Alaska, Fairbanks, Alaska.

"Effect of Alloying in Metallic Arc Welding," by R. W. Emerson, Westinghouse Electric & Mfg Co., East Pittsburgh, Pa.

"Manganese in Rutile-Type Coated Steel Electrodes," by E. G. Enck, Foote Mineral Co., Philadelphia.

"Creep Tests of Arc Welded Low Carbon Steel," by N. F. Ward, University of California.

9:30 A. M.—Stevens Hotel

Machinery Construction

"Use of Steel Castings and Rolled Steel Plate in Welded Fabrication," by H. J. Shiffli and Emil Krecji, American Steel Foundries, East Chicago, Ind.

"Plate Edge Preparation for Welding," by H. E. Rockefeller, the Linde Air Products Co., New York.

"Flow of Materials in Production Welding," by W. W. Petry, Cincinnati Milling Machine Co., Cincinnati.

"Welding Heavy Presses," by L. J. McDonough and J. R. Henry, Clearing Machine Corp., Chicago.

2:00 P. M.—Stevens Hotel

Fundamental Research

"Further Studies of Spot Welding of Low Carbon and Stainless Steels," by W. F. Hess and R. A. Wyant, Rensselaer Polytechnic institute, Troy, N. Y.

"Cold Rolling Testing of Welded Steel Structures," by R. L. Dowdell and T. P. Hughes, University of Minnesota, Minneapolis.

"Contact Resistance in Spot Welding," by F. J. Studer, Union college, Schenectady, N. Y.

"Weld Inspection by Means of Trepanned Plugs," by W. T. Tiffin, University of Oklahoma.

"Welding of Copper," by A. P. Young, Michigan College of Mining and Technology.

2:00 P. M.—Stevens Hotel

Welding in Equipment Construction

"Fabrication of Road Building Equipment," by L. L. Burger, La-Plant-Choate Mfg. Co. Inc., Cedar Rapids, Iowa.

"Designing Construction Machinery for Production by Welding," by H. C. Hettelsater, Harnischfeger Corp., Milwaukee.

"Cutting and Welding Stainless Clad Steel," by W. B. Keelor, Farwell, Ozmun, Kirk & Co., St. Paul.

"Large Equipment Fabrication," by Leslie McPhee, Whiting Corp., Harvey, Ill.

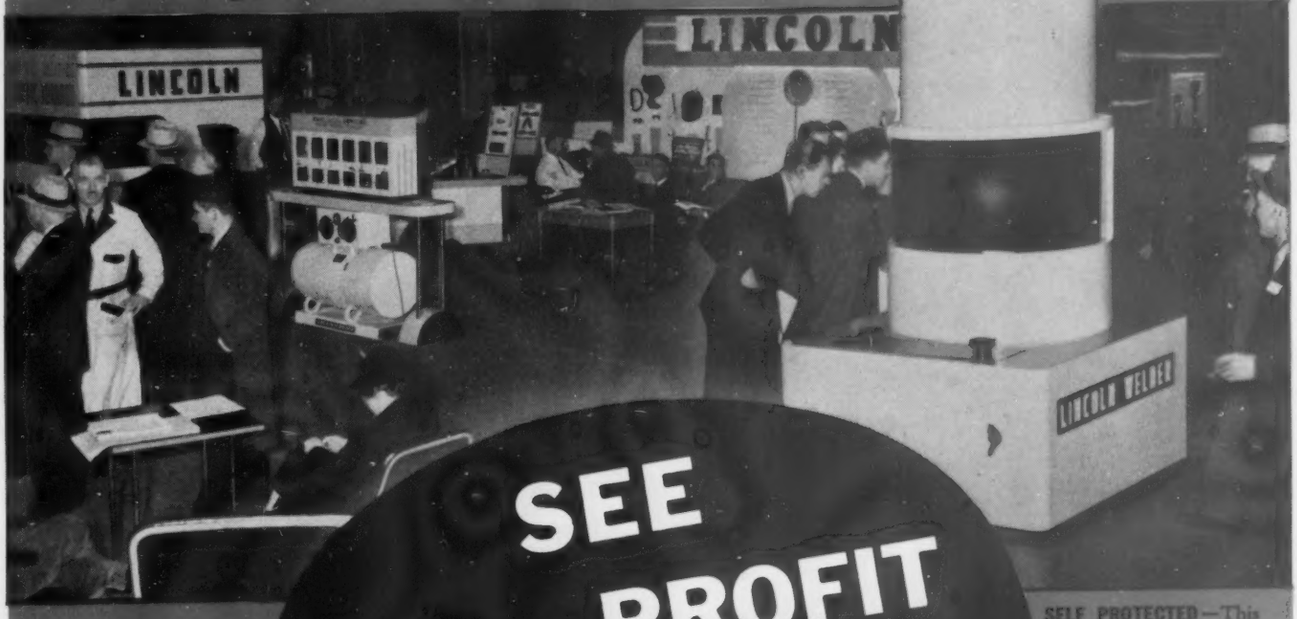
(*Please turn to Page* 172)

Harry C. Boardman

President, American Welding Society. He is research engineer, Chicago Bridge & Iron Co., Chicago

When at the METAL SHOW—

Look into the latest in arc welding at the Lincoln exhibit. This giant model of the "Shield-Arc Jr." is one of the demonstration booths.



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JOB SELECTOR and Current Control—both Self-Indicating and Continuous—of this New *"Shield-Arc Junior"* provide any TYPE of arc and any AMPERAGE for easy accurate setting. Assure top speed and quality on every job. In ratings of 75, 100, 150 and 200 amps.

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REDUCE MACHINE COSTS

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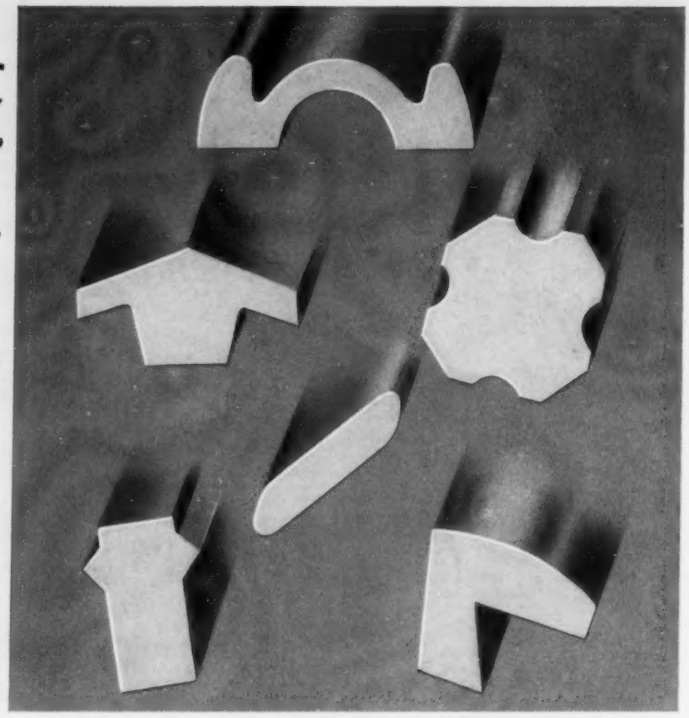

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Monday, Oct. 23

10:00 A. M.—BLACKSTONE HOTEL

Institute of Metals Division

Die Casting Alloys

"A Study of the Action of Molten Zinc Alloys on Pressure Die Casting Equipment," by E. A. Anderson, chief, metal section, Gerald Edmunds, investigator, and C. W. Siller, physical chemist and investigator, research division, New Jersey Zinc Co., Palmerton, Pa.

"A High-Strength Silicon-Brass Die Casting Alloy," by Alan U. Seybolt, research metallurgist, and B. W. Gonser, supervising metallurgist, Battelle Memorial institute, Columbus, O.

10:00 A. M.—BLACKSTONE HOTEL

Iron and Steel Division

Passivity and Pitting of Stainless Steel

"Nature of Passivity in Stainless Steel and Other Alloys, III," by H. H. Uhlig, research associate, department of chemical engineering, Massachusetts Institute of Technology, Cambridge, Mass.

"Data on Pit Focii," by R. Buehl, research assistant, and John Wulff, associate professor of physical metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

12:15 P. M.—BLACKSTONE HOTEL

Luncheon of Institute of Metals division executive committee.

Luncheon of committee on physical chemistry of steelmaking.

2:00 P. M.—BLACKSTONE HOTEL

Institute of Metals Division

Cast Brass and Bronze

"Beneficial Effects of Zirconium in Cast Nickel-Silicon Bronzes," by F. R. Hensel, metallurgical consultant, E. I. Larsen, division engineer, and A. S. Doty, metallurgical engineer, P. R. Mallory & Co., Inc., Indianapolis.

"A Study of Distribution of Structural and Physical Characteristics through the Bodies of Large Castings of Gun Metal," by A. A. Bradd, research associate in engineering, materials testing laboratory, College of City of New York.

"A Study of Distribution of Structural and Physical Characteristics through the Bodies of Large Castings of Red Brass," by Allen M. Rahm, research associate in engineering, materials testing laboratory, College of City of New York.

2:00 P. M.—BLACKSTONE HOTEL

Iron and Steel Division

Magnetic Methods in Research and Control

"Magnetic Analyses of Transformations in a Cold Worked 18-8 Alloy," by R. Buehl, research assistant, H. Hollomon, student, and John Wulff, associate professor of physical metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

"A New Instrument for Magnetic Determination of Carbon in a Steel Bath," by H. K. Work, manager of research and development, and H. T. Clark, physicist, Jones & Laughlin Steel Corp., Pittsburgh.

"An Apparatus for Determining Thermomagnetic Behavior of Slags and Some Preliminary Results Obtained with It," by B. A. Rogers, senior metallurgist, and K. O. Stamm, junior metallurgist, bureau of mines, Washington.

Tuesday, Oct. 24

10:00 A. M.—BLACKSTONE HOTEL

Institute of Metals Division

Structural Metallography

"Structure of Aluminum After Compression," by Charles S. Barrett,

(*Concluded on Page* 174)

Robert H. Leach

Chairman, Institute of Metals Division, American Institute of Mining and Metallurgical Engineers. He is engineer, Handy & Harman, Bridgeport, Conn.

J. Hunter Nead

Chairman, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers. He is chief metallurgist, Inland Steel Co., Chicago

Monday, Oct. 23

2:30 P. M.—CONGRESS HOTEL

Steel and Nonferrous Divisions

"Characteristics of Mild Steel Welding Wire," by J. C. Joublanc, Technical director, electrode division, Harnischfeger Corp., Milwaukee.

"Submerged Heat by Submerged Combustion," by Walter G. See, sales and service manager, Submerged Combustion Co. of America, Hammond, Ind.

"Boulder Dam and the World's Outstanding Transmission Lines," a lecture with motion pictures, by Dr. Donald M. Simmons, chief engineer, General Cable Corp., New York.

Tuesday, Oct. 24

9:30 A. M. —CONGRESS HOTEL

Steel Division

"Engineering of Continuous Strand Equipment," by Rodman R. Tatnall, metallurgist, Wickwire Spencer Steel Co., Worcester, Mass.

"Manufacture of Swedish Steel Rods," motion picture by Uddeholm Co. of America, New York.

9:30 A. M.—CONGRESS HOTEL

Nonferrous Division

"Coating Wire with Paper Pulp," by J. S. Little, manufacturing engineer, Western Electric Co., Kearny, N. J.

"Brazing of Copper," by L. L. Wyman, research engineer, General Electric Co., Schenectady, N. Y.

1:30 P. M.—CONGRESS HOTEL

Depart for visit to Hawthorne works, Western Electric Co.

Wednesday, Oct. 25

9:30 A. M.—CONGRESS HOTEL

Steel Division

"Atmospheric Annealing of Steel Wire," by Dr. A. A. Bates, manager, chemical and metallurgical division, and John Gier, associate metallurgist, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"Manufacture and Use of Stainless Steel Wire," by Stanley P. Watkins, manager, Rustless Iron & Steel Corp., Baltimore.

9:30 A. M.—CONGRESS HOTEL

Nonferrous Division

"Electrical Resistance Wires," by Dr. C. L. Mantell, technical director, Wilbur B. Driver Co., Newark, N. J.

"Manufacture and Uses of Wire Solder," by Robert A. Gardiner, president, Gardiner Metal Co., Chicago.

1:00 P. M.—CONGRESS HOTEL

Luncheon. Speaker: Maj. Gen. J. O. Mauborgne, chief signal officer, United States army, Washington.

3:00 P. M.—CONGRESS HOTEL

Annual Meeting

Reports of officers.

Mordica Memorial lecture: "A Correlation of Factors and Effects of Cold Drawing Wire Rods," by Dr. S. A. Braley, chief metallurgical field engineer, Pittsburgh Steel Co., Pittsburgh.

7:30 P. M.—CONGRESS HOTEL

Annual dinner.

Thursday, Oct. 26

9:45 A. M.—CONGRESS HOTEL

Steel and Nonferrous Divisions

Symposium: "Disposal of Waste Acid."

1:30 P. M.—CONGRESS HOTEL

Depart for visit to Republic Steel Corp. wire mill.

A.W.S. Program

(*Continued from Page* 168)

7:30 P. M.—STEVENS HOTEL

Fundamental research conference.

Wednesday, Oct. 25

9:30 A. M.—STEVENS HOTEL

Flame Hardening and Hard Surfacing

"Flame Hardening the Way Surfaces of Machine Tools," by Fred C. Dull, Monarch Machine Tool Co., Sidney, O.

"Hard Facing by Fusion Welding," by T. B. Jefferson, marine design section, war department, Washington.

"Flame Treating," by J. H. Zimmerman, the Linde Air Products Co., Newark, N. J.

"Flame Hardening from Standpoint of the Commercial Heat Treater," by W. G. Hamilton, Accurate Steel Treating Co. Inc., Chicago.

9:30 A. M.—STEVENS HOTEL

Resistance Welding

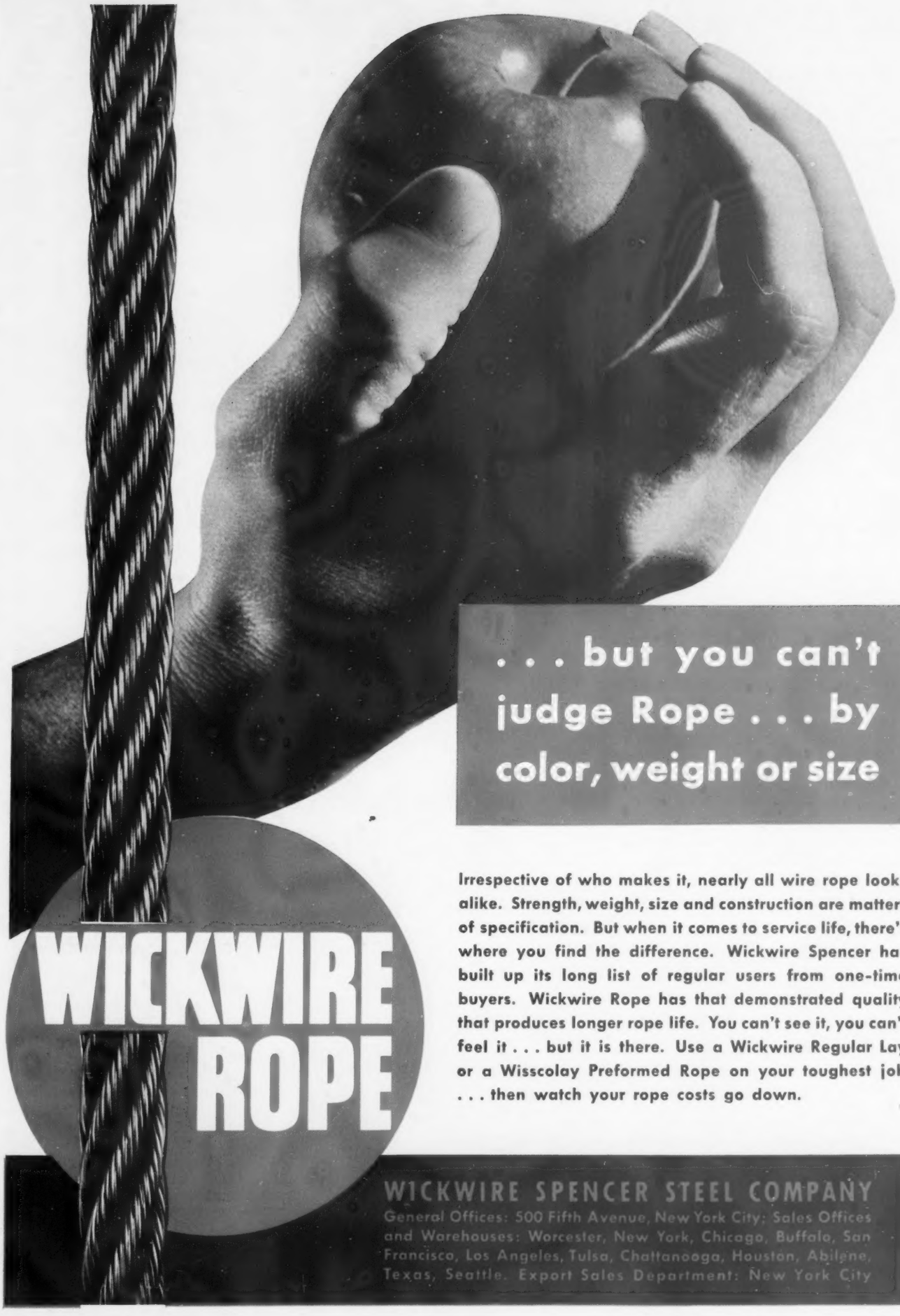
"Some Applications of the Resistance Welding Process," by C. L. Pfeiffer, Western Electric Co., Chicago.

"Precision Welding by the Resistance Method," by E. J. Bates and G. J. Oswald, National Cash Register Co., Dayton, O.

"Some Studies of Flash Welding,"

Frederick A. Westphal

President, Wire Association. He is superintendent of wire mills, Sheffield Steel Corp., Kansas City, Mo.



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by M. G. Yatsevitch, Watertown arsenal, Watertown, Mass.

2:00 P. M.—Stevens Hotel

Welded Piping, Pressure Vessels and Boilers

"Welding of Boilers and Pressure Vessels," by R. T. Kernoll, Edge Moor Iron Works, Edge Moor, Del.

"Oxyacetylene Welding of Red Brass Pipe," by A. N. Kugler, Air Reduction Sales Co., New York.

"Welded Nozzles and Their Reinforcement," by F. C. Fantz and W. G. Hooper, Midwest Piping & Supply Co. Inc., St. Louis.

"Extensions of Fusion Welding in Special Pipe and Pipe Fitting Applications," by E. Hall Taylor, Taylor Forge & Pipe Works, Chicago.

2:00 P. M.—Stevens Hotel

Resistance Welding

"Engineering Fundamentals of Resistance Welding," by S. M. Humphrey, Taylor-Winfield Corp., Warren, O.

"High Speed Welding Assemblies," by E. W. Forkner, Federal Machine & Welder Co., Warren, O.

"Application and Use of Portable Spot Welders," by C. E. Heitman, Edward G. Budd Mfg. Co., Philadelphia.

"Latest Developments in Resistance Welding," by R. T. Gillette, General Electric Co., Schenectady, N. Y.

Thursday, Oct. 26

9:30 A. M.—Stevens Hotel

Cutting and Welding in Steel Mills

"Repairs to Castings and Other Steel Mill Parts," by S. D. Baumer, Bethlehem Steel Co., Johnstown, Pa.

"Welding in a Steel Mill," by R. P. Palmer, Wheeling Steel Corp., Wheeling, W. Va.

"Flame Descaling and Flame Cleaning and Dehydrating," by J. G. Magrath, Air Reduction Sales Co., New York.

"Industrial Uses of Propane," by Messrs. Clary, Sheely and Fyke, Standard Oil Development Co., Elizabeth, N. J.

9:30 A. M.—Stevens Hotel

Welding in Structural and Ship Work

"High Spots in Ship Welding," by E. D. Debes, Bethlehem Shipbuilding Corp., Quincy, Mass.

"Designing Welded Frames for Continuity," by Bruce Johnston and E. H. Mount, Lehigh university, Bethlehem, Pa.

"Design and Fabrication of Welded Structures," by C. E. Loos and F. H. Dill, American Bridge Co., Ambridge, Pa.

"Present Day Practice in Structural Welding," by A. L. Wilson, Mississippi Valley Structural Steel Co., Decatur, Ill.

7:00 P. M.—Stevens Hotel

Annual banquet.

Friday, Oct. 27

9:30 A. M.—Stevens Hotel

Railroads

"Maintenance of Way Welding," by C. E. Morgan, Chicago, Milwaukee, St. Paul & Pacific railroad, Milwaukee.

"Production Panel Welding of Freight and Passenger Cars," by J. W. Sheffer, American Car & Foundry Co., New York.

9:30 A. M.—Stevens Hotel

Miscellaneous

"A Study of Welding Heat Effects," by Dr. W. A. Pearl, Armour Institute of Technology, Chicago.

"Welding in Manufacture of Valves for High Pressures and Temperatures," by W. F. Crawford and L. H. Carr, Edward Valve & Mfg. Co., East Chicago, Ind.

"Shrinkage of Steel to Correct Distortion from Welding and Forging," by S. T. Smetters, Sanitary District of Chicago.

11:30 A. M.—Stevens Hotel

Business Meeting

Report of president.

Election of officers.

Afternoon

Visit to Electro-Motoive Corp.

A.I.M.E. Program

(*Concluded from Page* 171)

member of staff, and Leonard H. Levenson, research assistant, metals research laboratory, Carnegie Institute of Technology, Pittsburgh.

"Recrystallization of Lead," by Paul A. Beck, research metallurgist, American Smelting & Refining Co., Barber, N. J.

"Tensile Deformation of Critically Oriented Brass Crystals," by H. L. Burghoff, research metallurgist, Chase Brass & Copper Co. Inc., Waterbury, Conn.

10:00 A. M.—Blackstone Hotel

Iron and Steel Division

Nitrogen in Iron—Metallography

"Solubility of Nitrogen in Molten Iron-Silicon Alloys," by J. C. Vaughan, Union Carbide & Carbon Research Laboratories Inc., Niagara Falls, N. Y., and John Chipman, department of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

"Studies of Erosion of Guns," by Peter R. Kosting, research metallurgist, Watertown arsenal, Watertown, Mass.

"Metallography of Tin and Zinc Coatings on Steel," by O. E. Romig, assistant research engineer, and D. H. Rowland, metallurgist, research laboratory, Carnegie-Illinois Steel Corp., Pittsburgh.

12:15 P. M.—Blackstone Hotel

Luncheon of Open Hearth executive committee.

2:00 P. M.—Blackstone Hotel

Institute of Metals Division

Constitutional Diagrams

"Constitution and Microstructure of Copper-Rich Silicon-Copper Alloys," by Cyril S. Smith, research metallurgist, American Brass Co., Waterbury, Conn.

"Alpha Solubility Limit and First Intermediary Phase in the Copper-Silicon System," by A. G. H. Anderson, chief metallurgist, department of development and research, Phelps Dodge Corp., Elizabeth, N. J.

"A Simple Method of Thermal Analysis Permitting Quantitative Measurements of Specific and Latent Heats," by Cyril S. Smith, research metallurgist, American Brass Co., Waterbury, Conn.

2:00 P. M.—Blackstone Hotel

Iron and Steel Division

Blast Furnace Operation — White Cast Iron

"Desulphurization of Pig Iron with Calcium Carbide," by C. E. Wood, acting supervising engineer, E. P. Barrett, metallurgist, and W. F. Holbrook, assistant chemist, blast furnace studies section, bureau of mines, Washington.

"Reduction of Iron Ores Under Pressure by Carbon Monoxide," by Michael Tenenbaum, department of metallurgy, and T. L. Joseph, professor of metallurgy, University of Minnesota, Minneapolis.

"Graphitization of Cementite in Cupola White Iron," by N. A. Ziegler, research metallurgist, W. L. Meinhart and A. J. Deacon, metallurgical engineers, Crane Co., Chicago.

8:00 P. M.—Blackstone Hotel

Annual dinner. Speaker: C. M. White, vice president in charge of operations, Republic Steel Corp., Cleveland. Subject: "Citizenship."

Wednesday, Oct. 25

12:15 P. M.—Blackstone Hotel

Luncheon of Iron and Steel division executive committee.

2:00 P. M.—Blackstone Hotel

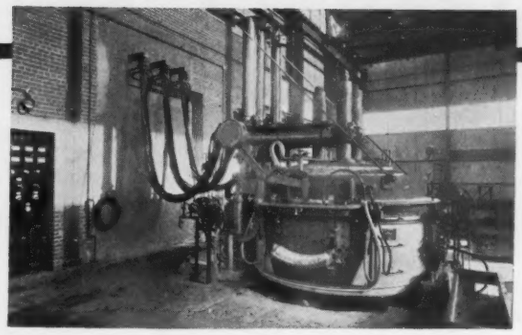
Institute of Metals Division

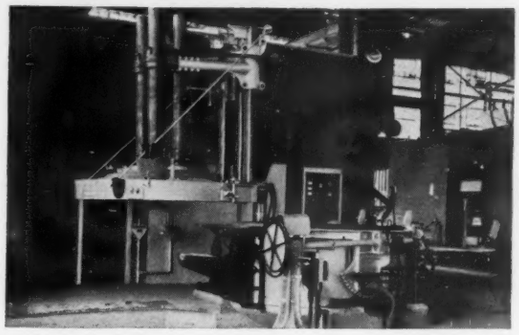
Magnesium-Copper-Gold

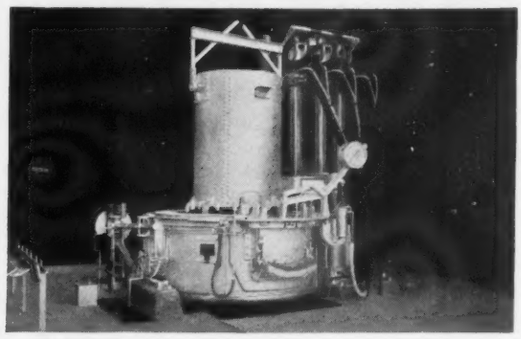
"Tensile Properties of Rolled Magnesium Alloys. I—Binary Alloys with Aluminum, Antimony, Bismuth, Cadmium, Copper, Lead, Nickel, Silver, Thallium, Tin and Zinc," by John C. McDonald, research physicist, Dow Chemical Co., Midland, Mich.

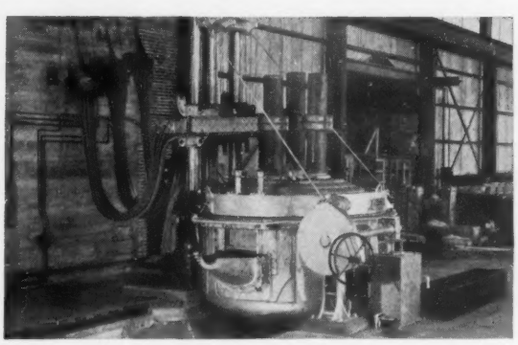
"Copper Embrittlement—IV," by L. L. Wyman, research metallurgist, General Electric Co., Schenectady, N. Y.

"Effect of Composition Upon Physical and Chemical Properties of 10K Gold Alloys," by Tracy C. Jarrett, assistant metallurgist, research department, American Optical Co., Southbridge, Mass.









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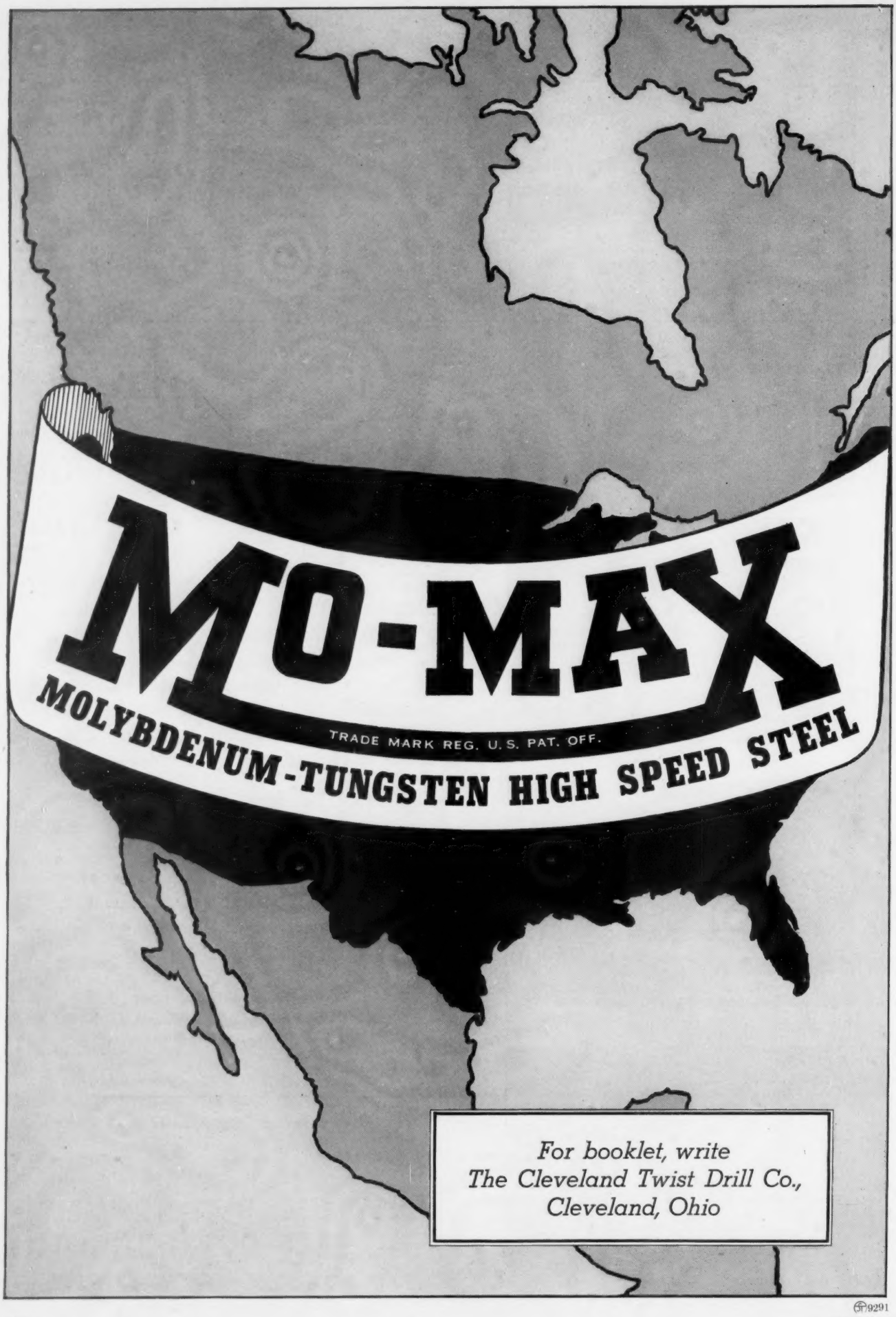
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EXHIBITORS and PRODUCTS

NATIONAL METAL SHOW

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EXPOSITION HOURS

Monday.....12:00 M. to 10:30 P.M. **Wednesday**....12:00 M. to 10:30 P.M.
Tuesday.....12:00 M. to 10:30 P.M. **Thursday**.....12:00 M. to 6:00 P.M.
Friday.....12:00 M. to 10:30 P.M.

Acme Steel Co., Chicago K-312
Strip steel in special finishes.

Advance Polishing Wheels Inc., Chicago.....E-128
Polishing wheels.

Air Reduction Sales Co., New York.....M-319
Oxyacetylene welding and cutting apparatus.

Ajax Electric Co. Inc., Philadelphia.....A-101
Electric heat treating furnaces.

Ajax Electrothermic Corp., Trenton, N. J. A-101
High-frequency heat treating and melting furnaces.

Allegheny Ludlum Steel Corp., Brackenridge, Pa...C-117
Stainless, heat-resisting steels; tool steels.

Edgar Allen Steel Co., New York.....E-120
Tool and die steels.

Alox Corp., Niagara Falls, N. Y. B-130
Corrosion preventatives.

Aluminum Co. of America, Pittsburgh.....G-201
Aluminum alloys.

American Brass Co., Waterbury, Conn. A-104
Copper alloys; welding rods.

American Car & Foundry Co., New York.....C-106
Electric bar, forging and rivet heaters.

American Chain & Cable Co., Andrew C. Campbell Division, Bridgeport, Conn., Page Steel & Wire Division, Monessen, Pa. M-323
Nibbling machines; die sets; welding wire.

American Cyanamid & Chemical Corp., New York A-132
Case hardening and carburizing materials.

American Foundry Equipment Co., Mishawaka, Ind. L-323
Airless abrasive cleaning and descaling equipment.

American Gas Association, New York.....Gas Section
Industrial gas equipment.

American Gas Furnace Co., Elizabeth, N. J..Gas Section
Gas heat treating furnaces; burners, accessories.

American Institute of Mining and Metallurgical Engineers, New York J-320
Educational exhibit.

American Machine & Metals Inc., Riehle Testing Machine Division, East Moline, Ill. A-117
Testing machines.

American Machinist, New York I-212
Publications.

American Brake Shoe & Foundry Co., American Manganese Steel Division, Chicago Heights, Ill..N-311
Manganese steel castings.

American Metal Market, New York K-318
Publications.

American Screw Co., Boston.....E-132
Bolts and screws.

American Society for Metals.....E-123
Educational exhibit.

American Steel & Wire Co., Cleveland G-205
Wire and rods; stainless and cold finished strip.

American Welding Society, New York.....C-121
Educational exhibit.

Ampco Metal Inc., Milwaukee.....C-118
High-strength nonferrous alloys.

Arcos Corp., Philadelphia L-304
Welding electrodes.

Armstrong Cork Co., Lancaster, Pa. K-322
Insulating firebrick and cements.

Audubon Wire Cloth Corp., Philadelphia N-329
Mesh, space and flexible wire cloth; conveyor belts.

Automatic Gasflux Inc., Cleveland.....D-107
Welding and cutting fluxes.

Automotive Industries, Philadelphia B-106
Publications.

Babcock & Wilcox Co., New York.....B-107
Refractories.

Baldwin-Southwark Corp., Philadelphia D-118
Testing machines and accessories.

Bastian-Blessing Co., Chicago I-205
Oxyacetylene welding and cutting equipment.

Bausch & Lomb Optical Co., Rochester, N. Y.... D-119
Optical instruments for metallography, spectrography.

Bethlehem Steel Co., Bethlehem, Pa. L-319
Carbon and alloy steels; tool steels; wire.

Binks Mfg. Co., Chicago C-137
Spray painting equipment.

G. S. Blakeslee & Co., Cicero, Ill. N-317
Metal cleaning and degreasing machines.

Bliss & Laughlin Inc., Harvey, Ill. M-305
Cold finished bar steels and shafting.

Bristol Co., Waterbury, Conn. L-325
Pyrometers; automatic control equipment.

Brown Instrument Co., Philadelphia D-123
Pyrometers; automatic control equipment.

Adolph I. Buehler, Chicago B-120
Metallographic and laboratory equipment.

Cambridge Wire Cloth Co., Cambridge, Md. C-103
Conveyor belts; screens; wire cloth; baskets.

Carboloy Co. Inc., Detroit F-210
Cemented carbide tools and dies.

Carborundum Co., Globar Division, Niagara Falls, N. Y. J-317
Nonmetallic electric heating elements.

Carnegie-Illinois Steel Corp., Pittsburgh G-205
Carbon, alloy, high-tensile and stainless steels.

Central Scientific Co., Chicago M-315
Chemical laboratory equipment.

Chase Brass & Copper Co., Waterbury, Conn. L-301
Copper alloys; welding rods.

Chicago Screw Co., Chicago M-317
Bolts, nuts, screws.

Chicago Steel Foundry Co., Chicago C-105
Electric steel castings.

Chicago Tool & Engineering Co., Chicago L-324
Tools; jigs; fixtures.

Cleveland Overall Co., Cleveland K-317A
Work clothing.

Cleveland Quarries Co., Cleveland A-138
Silica firestone linings.

Climax Molybdenum Co., New York L-334
Molybdenum alloy steels and irons.

Columbia Steel Co., San Francisco G-205
Carbon, alloy, high-tensile and stainless steels.

Columbia Tool Steel Co., Chicago Heights, Ill. K-313
Tool steels.

Compressed Industrial Gases Inc., Chicago N-331
Industrial gases and apparatus.

Continental Industrial Engineers Inc., Chicago ..... Gas Section
Heat treating furnaces.

Continental Machines Inc., Minneapolis D-101
Precision filing and sawing machines.

Continental Roll & Steel Foundry Co., East Chicago, Ind. L-330
Castings; rolls; machinery.

Crown Rheostat & Supply Co., Chicago L-329
Plating and polishing equipment.

Crucible Steel Co. of America, New York N-322
Tool steels; stainless, corrosion-resisting steels.

Cyclone Fence Co., Waukegan, Ill. G-205
Steel fence; wire products.

DAILY METAL TRADE, Cleveland B-133
Publications and technical books.

Darwin & Milner Inc., Cleveland J-309
Tool and die steels.

Dayton-Rogers Mfg. Co., Minneapolis M-303
Metal stampings.

A. P. De Sanno & Son Inc., Phoenixville, Pa. N-312
Abrasive cutting and grinding equipment.

Despatch Oven Co., Minneapolis ..... Gas Section
Gas heat treating furnaces.

Detroit Testing Machine Co., Detroit A-113
Physical testing machines.

Harry W. Dietert Co., Detroit B-119
Spectrographic equipment; testing equipment.

Dill Mfg. Co., Cleveland K-317
Screw machine products; stampings.

Dow Chemical Co., Midland, Mich. M-302
Magnesium alloys.

Driver-Harris Co., Harrison, N. J. J-305
Heat and corrosion-resisting alloys.

E. I. duPont de Nemours & Co., R & H Chemicals Department, Wilmington, Del. A-111
Heat treating salts; pickling inhibitors; metal cleaners; plating chemicals; fluxes; acids.

Duraloy Co., Scottsdale, Pa. N-301
Heat-resisting alloys.

Durant Mfg. Co., Milwaukee M-304
Counting and measuring machines.

Ecco High Frequency Corp., New York K-316
High-frequency converter equipment.

Eclipse Fuel Engineering Co., Rockford, Ill. ..... Gas Section
Gas heat treating furnaces and accessories.

Electric Furnace Co., Salem, O. I-202
Heat treating furnaces.

Electro-Alloys Co., Elyria, O. A-102
Heat and corrosion-resisting alloys.

Electro Manganese Corp., Minneapolis N-326
Electrolytic manganese.

Electro Metallurgical Co., New York M-301, L-305
Alloy elements for iron and steel.

James L. Entwistle, Pawtucket, R. I. M-304
Counting and measuring machines.

Fahralloy Co., Harvey, Ill. A-135
Heat, corrosion and wear-resisting alloys.

Federal Machine & Welder Co., Warren, O. A-137
Electric welding machines.

Federal Products Corp., Providence, R. I. K-307
Precision measuring instruments.

A. Finkl & Sons Co., Chicago C-132
Die steels.

Firth-Sterling Steel Co., McKeesport, Pa. C-101
Carbide tools, dies; stainless, wear-resisting steels.

Fisher Scientific Co., Pittsburgh M-308
Metallographic and laboratory equipment.

Fitzsimons Co., Youngstown, O. G-212
Cold finished steels and shafting.

Foote Bros. Gear & Machine Co., Chicago B-135
Special alloy steels.

J. B. Ford Co., Wyandotte, Mich E-126
Metal cleaners; burnishing compounds.

THE FOUNDRY, Cleveland B-133
Publications and technical books.

Foxboro Co., Foxboro, Mass K-305
Automatic control instruments.

General Alloys Co., Boston F-205
Heat and corrosion-resisting alloys.

General Electric Co., Schenectady, N. Y. A-120
Electric furnaces; atmosphere controls; welders.

General Electric X-Ray Corp., Chicago A-120
X-ray inspection equipment.

Claud S. Gordon Co., Chicago A-113
Heat treating furnaces; accessories; steel cement.

Greenlee Foundry Co., Chicago E-125
Gray iron castings.

Grob Bros., Grafton, Wis. J-308
Die making equipment; band saws; filing machines.

Guyer Metal Products Corp., Chicago C-120
Cold drawn and pressed metal products.

Halcomb Steel Co., Syracuse, N. Y. N-323
Tool steels; alloy steels.

Handy & Harman, New York E-107
Brazing alloys; silver solders.

Charles Hardy Inc., New York B-108
Metal powders and powder products.

Harnischfeger Corp., Milwaukee B-122
Electric welding equipment; motors.

Harvey Metal Corp., Chicago I-214
Brass forgings.

Hauck Mfg. Co., Brooklyn, N. Y. I-213
Oil and gas burners; regulating valves.

C. I. Hayes Inc., Providence, R. I. B-102
Electric heat treating furnaces.

Haynes Stellite Co., Kokomo, Ind. M-301, L-305
Cutting tools; hard facings; castings.

Heat Treating and Forging, Pittsburgh E-104
Publications.

Heppenstall Co., Pittsburgh C-123
Forgings; die blocks; shear knives.

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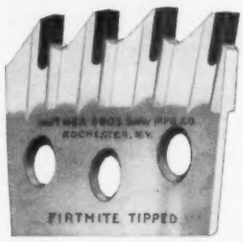

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Hevi Duty Electric Co., Milwaukee K-319
Electric heat treating furnaces.

Hobart Bros. Co., Troy, O. J-301
Arc welding equipment.

Holcroft & Co., Detroit B-121
Heat treating furnaces, kilns, ovens.

W. G. Holliday & Co., Indianapolis G-212
Cold finished steels and shafting.

Hollup Corp., Chicago N-331
Arc welders; welding equipment.

Charles A. Hones Inc., Baldwin, N. Y. ..... Gas Section
Gas furnaces, burners and accessories.

E. F. Houghton & Co., Philadelphia M-311
Heat treating salts; lubricants; cutting oil; belting.

Illinois Testing Laboratories Inc., Chicago I-210
Pyrometers; thermometers; control equipment.

Independent Pneumatic Tool Co., Chicago M-326
Portable electric tools.

Industrial Heating, Pittsburgh B-118
Publications.

Industry and Welding, Cleveland J-326
Publications.

Ingersoll Steel & Disc Division, Borg-Warner Corp., New Castle, Ind. J-307
Alloy, stainless-clad and tool steels.

International Nickel Co. Inc., New York C-125
Nickel and nickel alloys.

Iron Age, New York M-325
Publications.

Johns-Manville, New York E-105
Insulating and refractory materials.

Jones & Laughlin Steel Corp., Pittsburgh ..... B 117
Hot and cold finished steels; wire.

J. W. Kelley Co., Cleveland L-308
Industrial oils; heat treating products.

M. W. Kellogg Co., New York L-306
Bonded steel-corrosion-resisting alloy plates.

C. M. Kemp Mfg. Co., Baltimore ..... Gas Section
Gas generators; immersion heating units; accessories.

Krembs & Co., Chicago A-105
Welding, brazing and soldering supplies.

Kropp Forge Co., Chicago K-334
Forgings.

Krouse Fatigue Testing Machine Co., Columbus, O. J-310
Repeated-stress testing machines.

La Salle Steel Co., Chicago J-304
Cold finished steels.

Latrobe Electric Steel Co., Chicago L-315
Alloy steels; castings.

Lava Crucible Co., Pittsburgh K-314
Refractories; ramming mixes; cements.

R. Lavin & Son, Chicago C-107
Smeltery products.

Leeds & Northrup Co., Philadelphia J-313
Heat treating furnaces; control instruments.

Lepel High Frequency Laboratories, New York B-110
High-frequency converters.

Lewis Institute, Chicago N-331
Educational exhibit.

C. F. L'Hommedieu & Sons Co., Chicago M-329
Plating and polishing supplies.

Lincoln Electric Co., Cleveland H-205
Arc welding machines; electrodes; motors.

Lindberg Engineering Co., Chicago F-202
Heat treating furnaces; control equipment.

Linde Air Products Co., New York M-301, L-305
Oxyacetylene welding and cutting apparatus.

Machinery, New York J-322
Publications.

Machinery & Welder Corp., St. Louis A-108
Electric welders.

Paul Maehler Co., Chicago ..... Gas Section
Gas-fired drying and baking ovens.

Magnaflux Corp., New York C-119
Magnetic inspection equipment.

Magnetic Analysis Corp., Long Island City, N. Y. J-314
Magnetic analysis equipment.

Mahr Mfg. Co., Minneapolis A-119
Oil and gas furnaces; burners; nitrogen generators.

P. R. Mallory & Co. Inc., Indianapolis K-320
Welding electrode tips; electrical contacts.

Manganese Steel Forge Co., Philadelphia N-329
Rolled and forged manganese steel; screens.

Manhattan Rubber Mfg. Division, Passaic, N. J. E-122
Abrasive cut-off and finishing wheels.

Marburg Bros. Inc., New York J-323
Metal cutting machines; gages; pneumatic hammers.

Matchless Metal Polish Co., Chicago E-128
Polishing compounds.

Maurath Inc., Cleveland B-123
Welding electrodes.

McKay Co., Pittsburgh A-129
Welding electrodes; industrial chains.

Melville Shoe Corp., New York N-306
Factory safety shoes.

Mercury Mfg. Co., Chicago F-212
Electric trucks.

Metal & Thermit Corp., New York D-129
Welding electrodes; high-purity metals.

Metal Progress, Cleveland E-123
Publications.

Metallizing Co. of America Inc., Chicago N-304
Metal spray guns; compressors; sand blast generators.

Metallizing Engineering Co. Inc., New York N-316
Metal spray guns and supplies; blast cleaning equipment.

Metals & Alloys, New York K-315
Publications.

Metals Disintegrating Co., Elizabeth, N. J. D-108
Metal powders.

Metals Refining Division, Glidden Co., Hammond, Ind. F-207
Powdered metals.

Michiana Products Corp., Michigan City, Ind B-137
Heat and corrosion-resistant alloy castings.

Midvale Co., Philadelphia E-118
Forgings; corrosion-resisting castings.

A. Milne & Co., New York E-120
Tool and die steels.

Modern Collet & Machine Co., Detroit N-305
Hardness testing instruments.

Modern Industrial Press, Pittsburgh J-315
Publications.

Modern Machine Shop, Cincinnati E-119
Publications.

Molybdenum Corp. of America, Pittsburgh H-211
Molybdenum, tungsten alloys; ferroalloys; metal powders.

Monarch Steel Co., Indianapolis G-212
Cold finished steels and shafting.

National Carbide Corp., New York M-319
Carbide; carbide lights and lanterns.

National Copper Paint Co., Chicago B-126
Surface protection compounds for heat treatment.

National Cylinder Gas Co., Chicago A-126
Oxyacetylene cutting and flame hardening machines.

National Tube Co., Pittsburgh G-205
Seamless and welded tubular products.

New Jersey Zinc Co., New York L-311
Zinc alloys; die castings.

Ohio Crankshaft Co., Cleveland K-331
Electric induction hardening process.

Tinius Olsen Testing Machine Co., Philadelphia J-325
Testing machines and accessories.

Osborn Mfg. Co., Cleveland M-307
Foundry molding machinery.

Allegheny Ludlum Steel Corporation

Pittsburgh, Pennsylvania

October 2, 1939 Oliver Building

HILAND G. BATCHELLER
PRESIDENT

To Users of
High Speed Steel:

Gentlemen:

Reports are coming in from our branch offices indicating that a feverish condition exists in the minds of many users of cutting steels.

Fear seems rampant over just what may happen if the imports of tungsten are seriously curtailed. This open letter is, therefore, in direct answer to these reports, and I hope it may give needed assurance.

Allegheny Ludlum gets tungsten from an assured domestic source of supply from one of the largest and most reliable producers in this country.

Our new D-B-L Tool Steel contains less than 1/3 of the tungsten content of most high speed steels and the production, therefore, will not be seriously limited or restricted by what may happen to imports of tungsten.

D-B-L has come through comprehensive laboratory tests revealing its ability to give fine performance on a par with 18-4-1 tool steels and at less original cost. During the past two years it has actually replaced standard analysis high speed steels on many jobs because of its excellent performance in shop practice.

A folder giving heat treating data, hardness ranges, performance data, etc. is available for mailing and I shall be glad to have a copy sent to you.

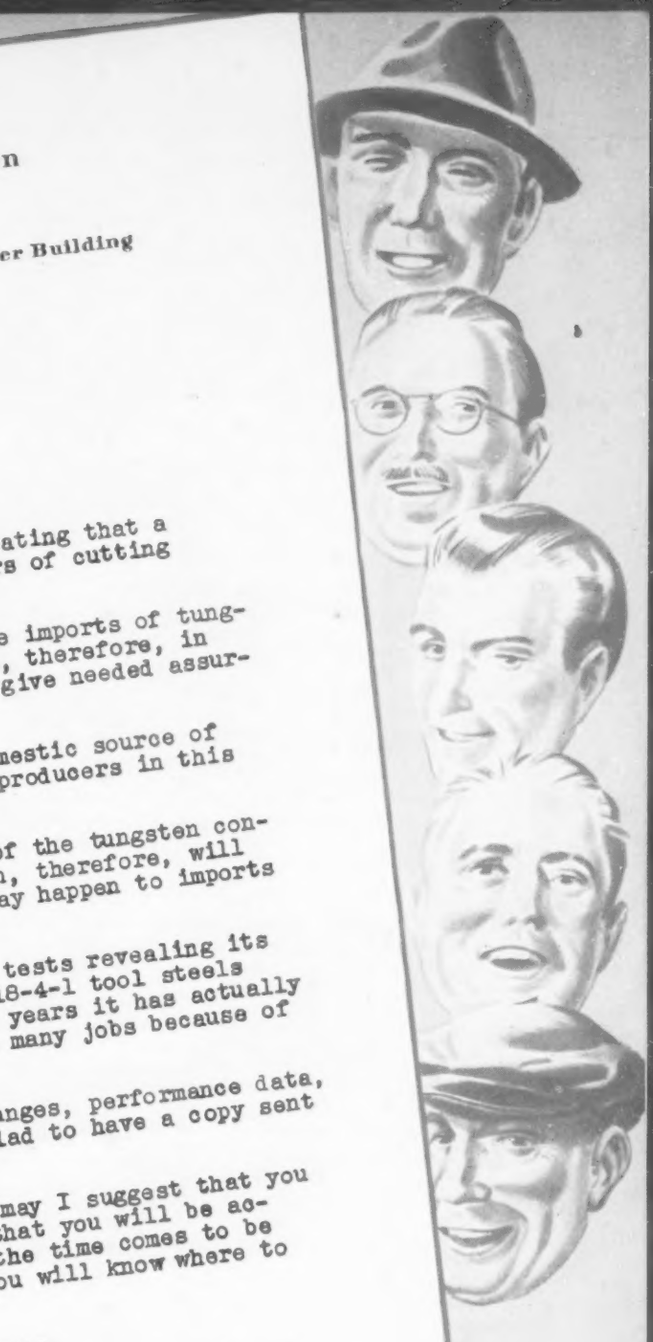
If you have not yet tried D-B-L in your shop, may I suggest that you order enough to make comprehensive tests, so that you will be acquainted with the handling of it. Then when the time comes to be fully protected on this strategic material, you will know where to turn for it.

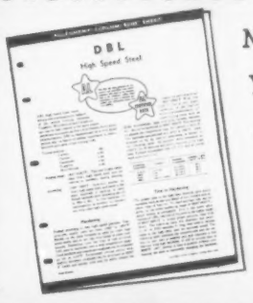
Very truly yours,

ALLEGHENY LUDLUM STEEL CORPORATION

H. G. Batcheller
President

HGB:D





Name.....

Your Position.....

Company.....

Street.....

City.....

State.....

ALLEGHENY LUDLUM
STEEL CORPORATION PITTSBURGH, PA.
Fine Steel Headquarters

Pangborn Corp., Hagerstown, Md. F-211
Blast cleaning and dust collecting equipment.

Park Chemical Co., Detroit I-208
Heat treating, buffing and polishing materials.

Parker-Kalon Corp., New York I-211
Screws and fastening devices.

Partlow Corp., New Hartford, N. Y. ..... Gas Section
Temperature control equipment.

Penton Publishing Co., Cleveland B-133
Publications and technical books.

Phillips Mfg. Co., Chicago N-302
Cleaning machines.

Pittsburgh Crucible Steel Co., Midland, Pa. N-323
Alloy steels; cold finished steels.

Production Machine Co., Greenfield, Mass. D-106
Polishing, finishing and surfacing machines.

Products Finishing, Cincinnati E-119
Publications.

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Pyrometers; radiation tubes.

Radium Chemical Co., New York J-318
Radiographic equipment.

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Cleaning machines.

Republic Steel Corp., Cleveland C-131
Alloy and stainless steels; wire; pig iron.

Resistance Welder Manufacturers' Association, Warren, O. A-137
Resistance welding.

Rustless Iron & Steel Corp., Baltimore G-210
Stainless steels and irons.

Joseph T. Ryerson & Son Inc., Chicago N-313
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Sentry Co., Foxboro, Mass. J-319
Hardening furnaces; high-temperature tube furnaces.

Sight Feed Generator Co., Richmond, Ind. C-104
Arc welders; acetylene generators.

Sleeper & Hartley Inc., Worcester, Mass. D-105
Wire and spring making machinery.

Spencer Turbine Co., Hartford, Conn. H-213
Turbo compressors; gas boosters; vacuum cleaners.

Standard Steel Spring Co., Coraopolis, Pa. L-314
Corrosion-proof coatings.

STEEL, Cleveland B-133
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Steel City Testing Laboratory, Detroit D-104
Testing machines.

Charles G. Stevens Co., Chicago L-303
Fine wire; cold rolled and tempered products.

N. A. Strand & Co., Chicago A-115
Flexible shaft equipment.

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Metals, ores, minerals, residues.

Surface Combustion Corp., Toledo, O. ..... Gas Section
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Synthane Corp., Oaks, Pa. M-313
Laminated bakelite.

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Carbon, alloy, high-tensile and stainless steels.

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Tinnerman Stove & Range Co., Cleveland G-208
Fastening devices.

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Titanium; ferroalloys; refractories.

Uddeholm Co. of America Inc., New York B-134
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Hacksaw machines; hacksaw blades.

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Metal bandsaws.

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Pyrometers; thermometers; control equipment.

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Wire Association, Stamford, Conn. D-120
Educational exhibit.

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Steelworks Pressed To Make Deliveries

Railroad, Shipbuilding, Auto Needs Heavy; Scrap Easier

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Demand
Active; new orders curtailed by previous contracting.

Prices
Concrete bars up $3; first quarter quotations awaited.

Production
Up 2 points to 89½ per cent.

■STEELWORKS continue to push operations to the limit of available capacity. Production moved up 2 more points to 89½ per cent last week. Delays will be encountered in engaging remaining capacity, and subsequent gains will be reduced by temporary shutdowns of some furnaces for repairs.

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COMPOSITE MARKET AVERAGES

	Oct. 14	Oct. 7	Sept. 30	One Month Ago Sept., 1939	Three Months Ago July, 1939	One Year Ago Oct., 1938	Five Years Ago Oct., 1934
Iron and Steel	$37.62	$37.74	$37.44	$36.67	$35.82	$36.48	$32.10
Finished Steel	55.90	55.90	55.60	55.60	55.62	57.04	54.00
Steelworks Scrap..	21.83	22.16	20.75	17.97	14.72	14.00	9.40

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

Finished Material

	Oct. 14, 1939	Sept. 1939	July 1939	Oct. 1938
Steel bars, Pittsburgh	2.15c	2.15c	2.15c	2.25c
Steel bars, Chicago	2.15	2.15	2.15	2.25
Steel bars, Philadelphia	2.47	2.47	2.47	2.57
Iron bars, Terre Haute, Ind.	2.15	2.05	2.05	2.15
Shapes, Pittsburgh	2.10	2.10	2.10	2.10
Shapes, Philadelphia	2.215	2.215	2.215	2.215
Shapes, Chicago	2.10	2.10	2.10	2.10
Plates, Pittsburgh	2.10	2.10	2.10	2.10
Plates, Philadelphia	2.15	2.15	2.15	2.15
Plates, Chicago	2.10	2.10	2.10	2.10
Sheets, hot-rolled, Pittsburgh	2.00	2.00	2.00	2.10
Sheets, cold-rolled, Pittsburgh	3.05	3.05	3.05	3.15
Sheets, No. 24 galv., Pittsburgh	3.50	3.50	3.50	3.50
Sheets, hot-rolled, Gary	2.00	2.00	2.00	2.10
Sheets, cold-rolled, Gary	3.05	3.05	3.05	3.15
Sheets, No. 24 galv., Gary	3.50	3.50	3.50	3.50
Bright bess., basic wire, Pitts.	2.60	2.60	2.60	2.60
Tin plate, per base box, Pitts.	$5.00	$5.00	$5.00	$5.35
Wire nails, Pittsburgh	2.55	2.40	2.40	2.45

Semifinished Material

Sheet bars, Pittsburgh, Chicago	$34.00	$34.00	$34.00	$34.00
Slabs, Pittsburgh, Chicago	34.00	34.00	34.00	34.00
Rerolling billets, Pittsburgh	34.00	34.00	34.00	34.00
Wire rods, No. 5 to $\frac{5}{16}$-inch, Pitts.	43.00	43.00	43.00	43.00

Pig Iron

	Oct. 14, 1939	Sept. 1939	July 1939	Oct. 1938
Bessemer, del. Pittsburgh	$24.34	$23.35	$22.34	$22.34
Basic, Valley	22.50	21.50	20.50	20.50
Basic, eastern, del. Philadelphia	24.34	23.54	22.34	22.34
No. 2 foundry, Pittsburgh	24.21	23.20	22.21	22.21
No. 2 foundry, Chicago	23.00	22.20	21.00	21.00
Southern No. 2, Birmingham	19.38	18.58	17.38	17.38
Southern No. 2 del. Cincinnati	22.89	22.09	20.89	20.89
No. 2X, del. Phila. (differ. av.)	25.215	24.415	23.215	23.215
Malleable, Valley	23.00	22.00	21.00	21.00
Malleable, Chicago	23.00	22.20	21.00	21.00
Lake Sup., charcoal, del. Chicago	30.34	29.54	28.34	28.34
Gray forge, del. Pittsburgh	23.17	22.15	21.17	21.17
Ferromanganese, del. Pittsburgh	105.33	95.35	85.33	97.77

Scrap

Heavy melting steel, Pittsburgh	$23.25	$18.75	$15.55	$14.95
Heavy melt. steel, No. 2, E. Pa.	20.25	17.10	13.55	12.95
Heavy melting steel, Chicago	19.75	16.25	13.55	13.05
Rails for rolling, Chicago	21.75	19.65	17.75	16.25
Railroad steel specialties, Chicago	21.75	18.00	15.50	15.55

Coke

Connellsville, furnace, ovens	$5.00	$3.75	$3.75	$3.75
Connellsville, foundry, ovens	6.00	5.00	5.00	5.00
Chicago, by-product fdry., del.	10.50	10.50	10.50	10.50

STEEL, IRON, RAW MATERIAL, FUEL AND METALS PRICES

Except when otherwise designated, prices are base, f.o.b. cars.

Sheet Steel

Hot Rolled

Pittsburgh	2.00c
Chicago, Gary	2.00c
Cleveland	2.00c
Detroit, del.	2.10c
Buffalo	2.00c
Sparrows Point, Md.	2.00c
New York, del.	2.24c
Philadelphia, del.	2.17c
Granite City, Ill.	2.10c
Middletown, O.	2.00c
Youngstown, O.	2.00c
Birmingham	2.00c
Pacific Coast points	2.50c

Cold Rolled

Pittsburgh	3.05c
Chicago, Gary	3.05c
Buffalo	3.05c
Cleveland	3.05c
Detroit, delivered	3.15c
Philadelphia, del.	3.37c
New York, del.	3.39c
Granite City, Ill.	3.15c
Middletown, O.	3.05c
Youngstown, O.	3.05c
Pacific Coast points	3.65c

Galvanized No. 24

Pittsburgh	3.50c
Chicago, Gary	3.50c
Buffalo	3.50c
Sparrows Point, Md.	3.50c
Philadelphia, del.	3.67c
New York, delivered	3.74c
Birmingham	3.50c
Granite City, Ill.	3.60c
Middletown, O.	3.50c
Youngstown, O.	3.50c
Pacific Coast points	4.00c

Black Plate, No. 29 and Lighter

Pittsburgh	3.05c
Chicago, Gary	3.05c
Granite City, Ill.	3.15c

Long Ternes No. 24 Unassorted

Pittsburgh, Gary	3.80c
Pacific Coast	4.50c

Enameling Sheets

	No. 10	No. 20
Pittsburgh	2.75c	3.35c
Chicago, Gary	2.75c	3.35c
Granite City, Ill.	2.85c	3.45c
Youngstown, O.	2.75c	3.35c
Cleveland	2.75c	3.35c
Middletown, O.	2.75c	3.35c
Pacific Coast	3.35c	3.95c

Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

Chrome-Nickel

	No. 302	No. 304
Bars	24.00	25.00
Plates	27.00	29.00
Sheets	34.00	36.00
Hot strip	21.50	23.50
Cold strip	28.00	30.00

Straight Chromes

	No. 410	No. 430	No. 442	No. 446
Bars	18.50	19.00	22.50	27.50
Plates	21.50	22.00	25.50	30.50
Sheets	26.50	29.00	32.50	36.50
Hot strip	17.00	17.50	24.00	35.00
Cold stp.	22.00	22.50	32.00	52.00

Steel Plate

Pittsburgh	2.10c
New York, del.	2.29c-2.54c
Philadelphia, del.	2.15c-2.40c
Boston, delivered	2.46c
Buffalo, delivered	2.33c
Chicago or Gary	2.10c
Cleveland	2.10c
Birmingham	2.10c
Coatesville, Pa.	2.35c
Sparrows Point, Md.	2.10c
Claymont, Del.	2.10c-2.35c
Youngstown	2.10c
Gulf ports	2.45c
Pacific Coast points	2.60c

Steel Floor Plates

Pittsburgh	3.35c
Chicago	3.35c
Gulf ports	3.70c
Pacific Coast ports	3.95c

Standard Shapes

Pittsburgh	2.10c
Philadelphia, del.	2.21½c
New York, del.	2.27c
Boston, delivered	2.41c
Bethlehem	2.10c
Chicago	2.10c
Cleveland, del.	2.30c
Buffalo	2.10c
Gulf ports	2.45c
Birmingham	2.10c
St. Louis, del.	2.34c
Pacific Coast points	2.70c

Tin and Terne Plate

Tin Plate, Coke (base box)

Pittsburgh, Gary, Chicago	$5.00
Granite City, Ill.	5.10

Mfg. Terne Plate (base box)

Pittsburgh, Gary, Chicago	$4.30
Granite City, Ill.	4.40

Bars

Soft Steel

(Base, 20 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Duluth	2.25c
Birmingham	2.15c
Cleveland	2.15c
Buffalo	2.15c
Detroit, delivered	2.25c
Philadelphia, del.	2.47c
Boston, delivered	2.52c
New York, del.	2.49c
Gulf ports	2.50c
Pacific Coast points	2.75c

Rail Steel

(Base, 5 tons or over)

Pittsburgh	2.15c
Chicago or Gary	2.15c
Detroit, delivered	2.25c
Cleveland	2.15c

Buffalo	2.15c
Birmingham	2.15c
Gulf ports	2.50c
Pacific Coast points	2.75c

Iron

Chicago, Terre Haute	2.15c
Philadelphia	2.37c
Pittsburgh, refined	3.50-8.00c

Reinforcing

*New Billet Bars, Base**

Chicago, Gary, Buffalo, Cleve., Birm., Young., Sparrows Pt., Pitts.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

*Rail Steel Bars, Base**

Pittsburgh, Gary Chicago, Buffalo, Cleveland, Birm.	2.15c
Gulf ports	2.50c
Pacific Coast ports	2.60c

**Base prices 20 cents less per 100 lbs. in lots of 20 tons or over of one size, in lengths of 30 feet or over, for shipment at one time to one destination.*

Wire Products

Pitts-Cleve.-Chicago-Birm. base per 100 lb. keg in carloads

Standard wire nails	$2.55
Cement coated nails	2.55
(Per pound)	
Polished fence staples	2.55c
Galv. barbed wire, standard 12½ gage two-point hog, 80-rod spool $2.88; two-point cattle, 80-rod spool	$2.70
Annealed fence wire	2.90c
Galv. fence wire	3.30c
Woven wire fencing (base C. L. column)	57.00
Single loop bale tie (base C. L. column)	56.00

To Manufacturing Trade

Base, Pitts. - Cleve. - Chicago-Birmingham (except spring wire)

Bright bess., basic wire	2.60c
Galvanized wire	2.65c
Spring wire	3.20c

Worcester, Mass., $2 higher on bright basic and spring wire.

Cut Nails

Carload, Pittsburgh $3.70

Cold-Finished Bars

	Carbon	Alloy
Pittsburgh	2.65c	3.35c
Chicago	2.65c	3.35c
Gary, Ind.	2.65c	3.35c
Detroit	2.70c	*3.45c
Cleveland	2.65c	3.35c
Buffalo	2.65c	3.35c

* Delivered.

Alloy Bars (Hot)

(Base, 20 tons or over)

Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem 2.70c

Detroit, delivered 2.80c

Alloy S.A.E.	Alloy Diff.	Alloy S.A.E.	Alloy Diff.
2000	0.35	3100	0.70
2100	0.75	3200	1.35
2300	1.55	3300	3.80
2500	2.25	3400	3.20

4100 0.15 to 0.25 Mo. 0.55
4600 0.20 to 0.30 Mo. 1.50-2.00 Ni. 1.10
5100 0.80-1.10 Cr. 0.45
5100 Cr. spring flats 0.15
6100 bars 1.20
6100 spring flats 0.85
Cr. N., Van. 1.50
Carbon Van. 0.85
9200 spring flats 0.15
9200 spring rounds, squares 0.40

Electric furnace up 50 cents.

Strip and Hoops

(Base, hot strip, 1 ton or over; cold, 3 tons or over)

Hot Strip, 12-inch and less

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Middletown, Birmingham	2.00c
Detroit, del.	2.10c
Philadelphia, del.	2.32c
New York, del.	2.36c
Cooperage hoop, Youngs., Pitts.; Chicago, Birm.	2.10c
Cold strip, 0.25 carbon and under, Pittsburgh, Cleveland, Youngstown	2.80c
Chicago	2.90c
Detroit, del.	2.90c
Worcester, Mass.	3.00c

Carbon	Cleve.,	Pitts.
0.26—0.50	2.80c	
0.51—0.75	4.30c	
0.76—1.00	6.15c	
Over 1.00	8.35c	

Worcester, Mass. $4 higher.

Commodity Cold-Rolled Strip

Pitts.-Cleve.-Youngstown	2.95c
Detroit, del.	3.05c
Worcester, Mass.	3.35c

Lamp stock up 10 cents.

Rails, Fastenings

(Gross Tons)

Standard rails, mill	$40.00
Relay rails, Pittsburgh 20—100 lbs.	32.50-35.50
Light rails, billet qual., Pitts., Chicago, B'ham.	$40.00
Do., rerolling quality	39.00

Cents per pound

Angle bars, billet, mills	2.70c
Do., axle steel	2.35c
Spikes, R. R. base	3.00c
Track bolts, base	4.15c
Car axles forged, Pitts., Chicago, Birmingham	3.15c
Tie plates, base	2.15c

Base, light rails 25 to 60 lbs., 20 lbs., up $2; 16 lbs. up $4; 12 lbs. up $8; 8 lbs. up $10. Base railroad spikes 200 kegs or more; base plates 20 tons.

Bolts and Nuts

F.o.b. Pittsburgh, Cleveland, Birmingham, Chicago. Discounts for carloads additional 5%, for full containers additional 10%.

Carriage and Machine

½ x 6 and smaller	68.5 off
Do. larger, to 1-in.	66 off
Do. 1⅛ and larger	64 off
Tire bolts	52.5 off

Stove Bolts

In packages with nuts separate 72.5 off; with nuts attached add 15%; bulk 83.5 off on 15,000 of 3-inch and shorter, or 5000 over 3-in.

Step bolts	60 off
Elevator bolts	60 off
Plow bolts	68.5 off

Nuts

	U.S.S.	S.A.E.
Semifinished hex. 6-inch and less	67	70
⅞-1-inch	64	65
1⅛ and larger	62	62

Hexagon Cap Screws

Upset, 1-in., smaller	70.0 off

Square Head Set Screws

Upset, 1-in., smaller	75.0 off
Headless set screws	64.0 off

Piling

Pitts., Chgo., Buffalo	2.40c
Gulf ports	2.85c
Pacific coast ports	2.90c

Rivets, Washers

Structural, Pittsburgh, Cleveland, Chicago ... 3.40c

⅞-inch and smaller, 11 and 12 ..... 63½ 54

Pitts., Chi., Cleve. ..65-10 off

Wrought washers, Pitts., Chi., Phila., to jobbers and large nut, bolt mfrs. l.c.l. $5.40; c.l. $5.75 off

Welded Iron, Steel Pipe

Base discounts on steel pipe. Pitts., Lorain, O., to consumers in carloads. Gary, Ind., 2 points less on lap weld, 1 point less on butt weld. Chicago delivery 2½ and 1½ less, respectively. Wrought pipe, Pittsburgh base.

Butt Weld

Steel

In.	Blk.	Galv.
½	63½	54
¾	66½	58
1—3	68½	60½

Iron

¾	30	13
1—1¼	34	19
1½	38	21½
2	37½	21

Lap Weld

Steel

2	61	52½
2½—3	64	55½
3½—6	66	57½
7 and 8	65	55½
9 and 10	64½	55

Iron

2	30½	15
2½—3½	31½	17½
4	33½	21
4½—8	32½	20
9—12	28½	15

Line Pipe

Steel

	Blk.	Galv.
1 to 3, butt weld	67½	
2, lap weld	60	
2½ to 3, lap weld	63	
3½ to 6, lap weld	65	
7 and 8, lap weld	64	
10-inch lap weld	63½	
12-inch, lap weld	62½	

Iron

	Blk.	Galv.
¾ butt weld	25	7
1 and 1¼ butt weld	29	13
1½ butt weld	33	15½
2 butt weld	32½	15
1½ lap weld	23½	7
2 lap weld	25½	9
2½ to 3½ lap weld	26½	11½
4 lap weld	28½	15
4½ to 8 lap weld	27½	14
9 to 12 lap weld	23½	9

Boiler Tubes

Carloads minimum wall seamless steel boiler tubes, cut lengths 4 to 24 feet; f.o.b. Pittsburgh, base price per 100 feet subject to usual extras.

Lap Welded

Sizes	Gage	Steel	Charcoal Iron
1½ "O.D.	13	$ 9.72	$23.71
1¾ "O.D.	13	11.06	22.93
2" O.D.	13	12.38	19.35
2¼ "O.D.	13	13.79	21.68
2¼ "O.D.	12	15.16	.....
2½ "O.D.	12	16.58	26.57
2¾ "O.D.	12	17.54	29.00
3" O.D.	12	18.35	31.36
3½ "O.D.	11	23.15	39.81
4" O.D.	10	28.66	49.90
5" O.D.	9	44.25	73.93
6" O.D.	7	68.14	.....

Seamless

Sizes	Gage	Hot Rolled	Cold Drawn
1 "O.D.	13	$ 7.82	$ 9.01
1¼ "O.D.	13	9.26	10.67
1½ "O.D.	13	10.23	11.79
1¾ "O.D.	13	11.64	13.42
2" O.D.	13	13.04	15.03
2¼ "O.D.	13	14.54	16.76
2¼ "O.D.	12	16.01	18.45
2½ "O.D.	12	17.54	20.21
2¾ "O.D.	12	18.59	21.42
3" O.D.	12	19.50	22.48
3½ "O.D.	11	24.62	28.37
4" O.D.	10	30.54	35.20
4½ "O.D.	10	37.35	43.04
5" O.D.	9	46.87	54.01
6" O.D.	7	71.96	82.93

Cast Iron Pipe

Class B Pipe—Per Net Ton

6-in., & over, Birm.	$45.00-46.00
4-in., Birmingham	48.00-49.00
4-in., Chicago	56.80-57.80
6-in. & over, Chicago	53.80-54.80
6-in. & over, east fdy.	49.00
Do., 4-in.	52.00

Class A Pipe $3 over Class B
Stnd. fitgs., Birm., base $100.00

Semifinished Steel

Rerolling Billets, Slabs

(Gross Tons)

Pittsburgh, Chicago, Gary, Cleve., Buffalo, Young., Birm., Sparrows Point	$34.00
Duluth (billets)	36.00
Detroit, delivered	36.00

Forging Quality Billets

Pitts., Chi., Gary, Cleve., Young., Buffalo, Birm.	40.00
Duluth	42.00

Sheet Bars

Pitts., Cleveland, Young., Sparrows Point, Buffalo, Canton, Chicago	34.00
Detroit, delivered	36.00

Wire Rods

Pitts., Cleveland, Chicago, Birmingham No. 5 to ⅜-inch incl.	43.00
Do., over ⅜ to 41/64-in.incl.	48.00

Worcester up $2; Galveston up $6; Pacific Coast up $9.

Skelp

Pitts., Chi., Youngstown, Coatesville, Sparrows Pt.	1.90c

Coke

Price Per Net Ton

Beehive Ovens

Connellsville, fur.	$5.00
Connellsville, fdry.	5.75 -6.25
Connell. prem. fdry.	6.00 -6.25
New River fdry.	6.50- 6.75
Wise county fdry.	5.50- 5.75
Wise county fur.	4.50- 4.75

By-Product Foundry

Newark, N. J., del.	11.38-11.85
Chi., ov., outside del.	9.75
Chicago, del.	10.50
Terre Haute, del.	10.00
Milwaukee, ovens	10.50
New England, del.	12.50
St. Louis, del.	11.00-11.50
Birmingham, ovens	7.00
Indianapolis, del.	10.00
Cincinnati, del.	9.75
Cleveland, del.	10.30
Buffalo, del.	10.50
Detroit, del.	10.25
Philadelphia, del.	11.15

Coke By-Products

Spot, gal., freight allowed east of Omaha

Pure and 90% benzol	16.00c
Toluol, two degree	22.00c
Solvent naphtha	26.00c
Industrial xylol	26.00c

Per lb. f.o.b. Frankford and St. Louis

Phenol (200 lb. drums)	16.25c
Do. (450 lbs)	15.25c

Eastern Plants, per lb.

Naphthalene flakes, balls, bbls. to jobbers	6.75c

Per ton, bulk, f.o.b. port

Sulphate of ammonia	$28.00

Pig Iron

Delivered prices include switching charges only as noted. No. 2 foundry is 1.75-2.25 sil.; 25c diff. for each 0.25 sil. above 2.25 sil.; 50c diff. below 1.75 sil. Gross tons.

Basing Points:	No. 2 Fdry.	Malleable	Basic	Bessemer
Bethlehem, Pa.	$24.00	$24.50	$23.50	$25.00
Birdsboro, Pa.	24.00	24.50	23.50	25.00
Birmingham, Ala.§	19.38	.....	18.38	24.00
Buffalo	23.00	23.50	22.00	24.00
Chicago	23.00	23.00	22.50	23.50
Cleveland	23.00	23.00	22.50	23.50
Detroit	23.00	23.00	22.50	23.50
Duluth	23.50	23.50	.....	24.00
Erie, Pa.	23.00	23.50	22.50	24.00
Everett, Mass.	24.00	24.50	23.50	25.00
Granite City, Ill.	23.00	23.00	22.50	23.50
Hamilton, O.	23.00	23.00	22.50	.....
Neville Island, Pa.	23.00	23.00	22.50	23.50
Provo, Utah	21.00	.....	.....	.....
Sharpsville, Pa.	23.00	23.00	22.50	23.50
Sparrow's Point, Md.	24.00	.....	23.50	.....
Swedeland, Pa.	24.00	24.50	23.50	25.00
Toledo, O.	23.00	23.00	22.50	23.50
Youngstown, O.	23.00	23.00	22.50	23.50

‡Subject to 38 cents deduction for 0.70 per cent phosphorus or higher.

Delivered from Basing Points:				
Akron, O., from Cleveland	24.39	24.39	23.89	24.89
Baltimore from Birmingham	24.78	.....	23.66	.....
Boston from Birmingham	24.12	.....	.....	.....
Boston from Everett, Mass.	24.50	25.00	24.00	25.50
Boston from Buffalo	24.50	25.00	24.00	25.50
Brooklyn, N. Y., from Bethlehem	26.50	27.00	.....	.....
Canton, O., from Cleveland	24.39	24.39	23.89	24.89
Chicago from Birmingham	†23.22	.....	.....	.....
Cincinnati from Hamilton, O.	23.24	24.11	23.61	.....
Cincinnati from Birmingham	23.06	.....	22.06	.....
Cleveland from Birmingham	23.32	.....	22.82	.....
Mansfield, O., from Toledo, O.	24.94	24.94	24.44	24.44
Milwaukee from Chicago	24.10	24.10	23.60	24.60
Muskegon, Mich., from Chicago, Toledo or Detroit	26.19	26.19	25.69	26.69
Newark, N. J., from Birmingham	25.15	.....	.....	.....
Newark, N. J., from Bethlehem	25.53	26.03	.....	.....
Philadelphia from Birmingham	24.46	.....	23.96	.....
Philadelphia from Swedeland, Pa.	24.84	25.34	24.34	.....
Pittsburgh district from Neville Island	Neville base, plus 69c, 84c, and $1.24 freight.			
Saginaw, Mich., from Detroit	25.45	25.45	24.95	24.95

	No. 2 Fdry.	Malleable	Basic	Bessemer
St. Louis, northern	23.50	23.50	23.00	....
St. Louis from Birmingham	†23.12	....	22.62	....
St. Paul from Duluth	25.63	25.63	....	26.13

†Over 0.70 phos.

Low Phos.

Basing Points: Birdsboro and Steelton, Pa., and Buffalo, N. Y., $28.50, base; $29.74 delivered Philadelphia.

Gray Forge		**Charcoal**	
Valley furnace	$22.50	Lake Superior fur.	$27.00
Pitts. dist. fur.	22.50	do., del. Chicago	30.34
		Lyles, Tenn.	26.50

†Silvery

Jackson county, O., base: 6-6.50 per cent $27.50; 6.51-7—$28.00; 7-7.50—$28.50; 7.51-8—$29.00; 8-8.50—$29.50; 8.51-9—$30.00; 9-9.50—$30.50; Buffalo, $1.25 higher.

Bessemer Ferrosilicon†

Jackson county, O., base; Prices are the same as for silveries, plus $1 a ton.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

Manganese differentials in silvery iron and ferrosilicon, 2 to 3%, $1 per ton add. Each unit over 3%, add $1 per ton.

Refractories

Per 1000 f.o.b. Works, Net Prices

Fire Clay Brick

Super Quality

Pa., Mo., Ky.	$60.80

First Quality

Pa., Ill., Md., Mo., Ky.	47.50
Alabama, Georgia	47.50
New Jersey	52.50

Second Quality

Pa., Ill., Ky., Md., Mo.	42.75
Georgia, Alabama	34.20
New Jersey	49.00
Ohio	
First quality	39.90
Intermediate	36.10
Second quality	31.35

Malleable Bung Brick

All bases	$56.05

Silica Brick

Pennsylvania	$47.50
Joliet, E. Chicago	55.10
Birmingham, Ala.	47.50

Ladle Brick

(Pa., O., W. Va., Mo.)

Dry press	$28.00
Wire cut	$26.00

Magnesite

Imported dead - burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags)	$45.00
Do. domestic	40.00
Do., f.o.b. Chewelah, Wash., net ton, bulk	22.00
net ton, bags	26.00
Quickset magnesite grains, f.o.b. Chewelah, Wash., net, bulk	22.00

Basic Brick

Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.

Chrome brick	$47.00
Chem. bonded chrome	47.00
Magnesite brick	67.00
Chem. bonded magnesite	57.00

Fluorspar

Washed gravel, duty pd., tide, net ton	$25.00
Washed gravel, f.o.b. Ill., Ky., net ton, carloads, all rail.	20.00
Do. barge	20.00
No. 2 lump	21.00-22.00

Ferroalloy Prices

Ferromanganese, 78-82%, tidewater, duty pd. $100.00
Do., del. Pittsburgh 105.33

Spiegeleisen, 19-21% dom. Palmerton, Pa., spot 32.00
Do., 26-28%, Palmerton 39.50

Ferrosilicon, 50% freight allowed, c.l. 69.50
Do., ton lot 80.50
Do., 75 per cent 126.00
Spot, $5 a ton higher.

Silicomanganese, 2½ c. 103.00
2% carbon, 108.00; 1%, 118.00
Contract ton price $11 higher; spot $5 over contract.

Ferrotungsten, stand., lb. con. del. cars 2.25

Ferrovanadium, 35 to 40%, lb., cont. 2.70-2.80-2.90

Ferrophosphorus, gr. ton, c.l., 17-18% Rockdale, Tenn., basis, 18%, $3 unitage, 58.50; electrolytic, per ton, c. l., 23-26% f.o.b. Monsanto, Tenn., 24% $3 unitage 75.00

Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb., contained cr., del. carlots 10.50c
Do., ton lots 11.25c
Do., less-ton lots 11.50c
67-72% carloads, 2% carbon, per lb. contained chrome 16.50c
Do., ton lots 17.25c
Do., less-ton lots 17.75c

	Carloads	Ton lots	Less ton
2% carb.	16.50c	17.25c	17.75c
1% carb.	17.50c	18.25c	18.75c
0.10% carb.	19.50c	20.25c	20.75c
0.20% carb.	18.50c	19.25c	19.75c

Spot ¼c higher

Ferromolybdenum, 55-65% molyb. cont., f.o.b. mill, lb. 0.95

Calcium molybdate, lb. molyb. cont., f.o.b. mill 0.80

Ferrotitanium, 40-45%, lb., con. ti., f.o.b. Niagara Falls, ton lots $1.23
Do., less-ton lots 1.25
20-25% carbon, 0.10 max., ton lots, lb. 1.35
Do, less-ton lots 1.40
Spot 5c higher

Ferrocolumbium, 50-60%, contract, lb. con. col., f.o.b. Niagara Falls $2.25
Do., less-ton lots 2.30
Spot is 10c higher

Technical molybdenum trioxide, 53 to 60% molybdenum, lb. molyb. cont., f.o.b. mill 0.80

Ferro-carbon-titanium, 15-18%, ti., 6-8% carb., carlots, contr., net ton $142.50
Do, spot 145.00
Do, contract, ton lots 145.00
Do, spot, ton lots 150.00

15-18% ti., 3-5% carbon, carlots, contr., net ton 157.50
Do, spot 160.00
Do, contract, ton lots 160.00
Do, spot, ton lots 165.00

Alsifer, contract carlots, f.o.b. Niagara Falls, lb. 7.50c
Do, ton lots 8.00c
Do, less-ton lots 8.50c
Spot ½c lb. higher

Chromium Briquets, contract, any quantity, freight allowed, lb. 7.25c
Do, spot carlots, bulk 7.50c
Do, ton lots 8.00c
Do., less-ton lots 8.25c

Tungsten Metal Powder, according to grade, spot shipment, 200-lb. drum lots, lb. $2.75
Do, smaller lots 2.85

Vanadium Pentoxide, contract, lb. contained $1.10
Do, spot 1.15

Chromium Metal, 98% cr., 0.50 carbon max., contract, lb. con. chrome 80.00c
Do, spot 85.00c
88% chrome, contract 79.00c
Do, spot 84.00c

Silicon Metal, 1% iron, contract, carlots, 2 x ⅛-in., lb. 14.00c
Do., 2% 12.50c
Spot ¼c higher

Silicon Briquets, contract carloads freight allowed, ton $69.50
Carload, spot 74.50
Less-ton lots, lb. 3.75c

Manganese Briquets, contract carloads, bulk freight allowed, lb. 5.00c
Ton lots 5.50c
Less-ton lots 5.75c
Spot ¼c higher

Zirconium Alloy, 12-15%, contract, carloads, gross ton $97.50
Do, spot 102.50

34-40%, contract, carloads, lb., alloy 14.00c
Do, ton lots 15.00c
Do, less-ton lots 16.00c
Spot ¼c higher

Molybdenum Powder, 99%, f.o.b. York, Pa. 200-lb. kegs, lb. $2.60
Do, 100-200 lb. lots 2.75
Do, under 100-lb. lots 3.00

Molybdenum Oxide Briquets, 48-52% molybdenum, per pound contained, f.o.b. producers' plant 80.00c

WAREHOUSE STEEL PRICES

Base Prices in Cents Per Pound, Delivered Locally, Subject to Prevailing Differentials

	Soft Bars	Bands	Hoops	Plates ¼-in. & Over	Structural Shapes	Floor Plates	Sheets: Hot Rolled	Sheets: Cold Rolled	Sheets: Galv. No. 24	Cold Rolled Strip	Cold Drawn Bars: Carbon	Cold Drawn Bars: SAE 2300	Cold Drawn Bars: SAE 3100
Boston	3.98	4.06	5.06	3.85	3.85	5.66	3.71	4.78	4.86	3.46	4.13	8.63	7.23
New York (Met.)	3.84	3.96	3.96	3.76	3.75	5.56	3.58	4.60	4.89	3.51	4.09	8.59	7.16
Philadelphia	3.85	3.85	4.35	3.55	3.55	5.25	3.55	4.55	4.68	3.51	4.06	8.56	7.16
Baltimore	3.95	4.10	4.45	3.70	3.70	5.25	3.55	4.90	5.05	....	4.05	....	....
Norfolk, Va.	4.15	4.25	....	3.90	3.90	5.45	3.75	....	5.40	....	4.15	....	....
Buffalo	3.35	3.82	3.82	3.62	3.40	6.40	4.20	6.30	5.00	4.45	6.15	10.40	9.55
Pittsburgh	3.35	3.60	3.60	3.40	3.40	5.00	3.35	....	4.75	3.35	3.65	8.35	6.95
Cleveland	3.25	3.50	3.50	3.40	3.58	5.18	3.35	4.55	4.62	3.20	3.75	8.15	6.75
Detroit	3.33	3.43	3.68	3.60	3.65	5.27	3.43	4.50	4.59	3.40	3.80	8.45	7.05
Cincinnati	3.60	3.67	3.67	3.65	3.68	5.28	3.42	....	4.57	3.45	4.00	8.50	7.10
Chicago	3.50	3.60	3.60	3.55	3.55	5.15	3.35	4.30	4.85	3.50	3.75	8.15	6.75
Twin Cities	3.75	3.85	3.85	3.80	3.80	5.40	3.60	4.95	4.50	3.83	4.34	8.84	7.44
Milwaukee	3.63	3.73	3.73	3.68	3.68	5.28	3.48	4.43	4.73	....	3.88	8.38	6.98
St. Louis	3.62	3.72	3.72	3.47	3.47	5.07	3.38	4.32	4.52	3.61	4.02	8.52	7.12
Kansas City	4.05	4.15	4.15	4.00	4.00	5.60	3.90	....	5.00	....	4.30	....	....
Memphis	3.90	4.00	4.00	3.95	3.95	5.71	3.75	....	5.00	....	4.31	....	....
Chattanooga	3.80	3.90	3.90	3.85	3.85	5.80	3.65	....	4.40	....	4.39	....	....
Tulsa, Okla.	4.44	4.54	4.54	4.33	4.33	5.93	4.24	....	5.19	....	4.69	....	....
Birmingham	3.50	3.60	3.60	3.55	3.55	5.88	3.35	....	4.85	....	4.43	....	....
New Orleans	3.85	4.65	4.65	3.80	3.80	5.75	4.10	....	4.60	5.00	5.10	....	....
Houston, Tex.	4.05	6.20	6.20	4.05	4.05	5.75	4.20	....	5.25	....	....	....	....
Seattle	4.00	3.85	5.20	3.40	3.50	5.75	3.70	6.50	4.75	....	5.60	....	....
Portland, Oreg.	4.00	4.40	6.10	4.00	4.00	5.50	3.95	6.50	4.75	....	5.85	....	....
Los Angeles	4.15	4.65	6.35	4.00	4.00	6.40	3.75	6.40	5.15	....	6.15	10.65	9.80
San Francisco	4.00	4.35	6.00	4.00	4.00	5.60	3.75	6.40	5.15	....	6.80	10.65	9.80

	SAE Hot-rolled Bars (Unannealed): 1035-1050	2300 Series	3100 Series	4100 Series	6100 Series
Boston	4.18	7.50	6.05	5.80	7.90
New York (Met.)	4.04	7.35	5.90	5.65	....
Philadelphia	4.10	7.31	5.86	5.61	7.71
Baltimore	4.10	....	....	....	....
Norfolk, Va.	....	....	....	....	....
Buffalo	3.55	7.10	5.65	5.40	7.50
Pittsburgh	3.40	7.35	5.95	5.50	7.60
Cleveland	3.30	7.30	5.85	5.85	7.70
Detroit	3.38	7.42	5.97	5.72	7.19
Cincinnati	3.65	7.44	5.99	5.74	7.84
Chicago	3.70	7.10	5.65	5.40	7.50
Twin Cities	3.95	7.45	6.00	6.09	8.19
Milwaukee	3.78	7.33	5.88	5.63	7.73
St. Louis	3.82	7.47	6.02	5.77	7.87
Seattle	5.85	....	8.00	7.85	8.65
Portland, Oreg.	5.70	8.85	8.00	7.85	8.65
Los Angeles	4.80	9.40	8.55	8.40	9.05
San Francisco	5.00	9.65	8.80	8.65	9.30

BASE QUANTITIES

Soft Bars, Bands, Hoops, Plates, Shapes, Floor Plates, Hot Rolled Sheets and SAE 1035-1050 Bars: Base, 400-1999 pounds, except 0-1999 pounds (hot rolled sheets only) in New York; 300-1999 pounds in Los Angeles; 0-299 pounds (hoops only) in San Francisco; 300-4999 pounds in Portland, Seattle; 400-14,999 pounds in Twin Cities; 400-3999 pounds in Birmingham.

Cold Rolled Sheets: Base, 400-1499 pounds in Chicago, Cincinnati, Cleveland, Detroit, New York and St. Louis; 450-3749 pounds in Boston; 500-1499 pounds in Buffalo; 1000-1999 pounds in Philadelphia; 300-4999 pounds in San Francisco and Portland; any quantity in Twin Cities.

Galvanized Sheets: Base, 0-1499 pounds in New York, Tulsa; 150-1499 pounds in Cleveland, Milwaukee, Pittsburgh, Baltimore, Norfolk; 150-1049 pounds in Los Angeles; 300-4999 pounds in Portland, San Francisco; 450-3749 pounds in Boston; 500-1499 pounds in Birmingham, Buffalo, Chicago, Cincinnati, Detroit, St. Louis; 1500 pounds and over in Chattanooga, Philadelphia; any quantity in Twin Cities.

Cold Rolled Strip: No base quantity; extras apply on lots of all size.

Cold Finished Bars: Base, 1500 pounds and over on carbon bars, 1000 pounds and over on alloy bars.

SAE Hot Rolled Alloy Bars: Base, 2000 pounds and over, except 0-4999 pounds in San Francisco; 0-1999 in Portland.

CURRENT IRON AND STEEL PRICES OF EUROPE

Dollars at Rates of Exchange, Oct. 11

Export Prices f. o. b. Port of Dispatch—

By Cable or Radio

	British gross tons U. K. ports £ s d	Quoted in dollars at current value	Continental Channel or North Sea ports, gross tons **Quoted in gold pounds sterling £ s d
Foundry, 2.50-3.00 Si.	$20.20 5 0 0	$18.32	2 3 0
Basic bessemer	....	19.59	2 6 0
Hematite, Phos. .03-.05	21.21 5 5 0	.....	.....
Billets	$29.80 7 7 6	$38.34	4 10 0
Wire rods, No. 5 gage	45.96 11 7 6	46.86	5 10 0
Standard rails	$38.38 9 10 0	$48.99	5 15 0
Merchant bars	1.98c 11 0 0	2.47c	6 7 8
Structural shapes	1.80c 10 0 0	2.35c to 2.47c	6 3 6 to 6 7 8
Plates, †¼ in. or 5 mm.	1.97c 10 18 9	2.81c	7 8 0
Sheets, black, 24 gage or 0.5 mm.	2.34c 13 0 0	2.95c	7 15 0°
Sheets, gal., 24 ga., corr.	2.82c 15 15 0	3.52c	9 5 0
Bands and strips	2.21c 12 5 0	2.10c to 2.33c	1,400 to 1,550*†
Plain wire, base	3.51c 19 10 0	3.04c	8 0 0
Galvanized wire, base	4.19c 23 5 0	3.61c to 3.66c	9 10 0 to 9 12 6
Wire nails, base	....	3.52c	9 5 0
Tin plate, box 108 lbs.	$ 4.09 1 0 3	.....	.....

British ferromanganese $80.00 delivered Atlantic seaboard duty-paid.

Domestic Prices at Works or Furnace—

Last Reported

	£ s d		French Francs		Belgian Francs		Reich §§Mark	
Fdy. pig iron, Si. 2.5	$20.00	4 19 0(a)	$15.56	679.30	$18.43	550	$25.20	63
Basic bess. pig iron	18.69	4 12 6(a)	.....	.....	.....	...	27.80	(b)69.50
Furnace coke	4.65	1 4 2	5.15	225	6.77	202	7.60	19
Billets	29.80	7 7 6	23.56	1,029	28.81	860	38.60	96.50
Standard rails	1.71c	9 10 0	1.41c	1,405	2.06c	1,375	2.38c	132
Merchant bars	2.09c	11 12 0††	1.30c	1,304	1.65c	1,100	1.98c	110
Structural shapes	1.87c	10 8 0††	1.27c	1,268	1.65c	1,100	1.93c	107
Plates, †¼-in. or 5 mm.	1.97c	10 19 3††	1.65c	1,650	2.05c	1,315	2.29c	127
Sheets, black	2.66c	04 15 0§	1.96c	1,958‡	2.36c	1,575‡	2.59c	144‡
Sheets, galv., corr., 24 ga. or 0.5 mm.	3.11c	17 5 0	2.85c	2,850	4.05c	2,700	6.66c	370
Plain wire	3.51c	19 10 0	2.00c	2,000	2.48c	1,650	3.11c	173
Bands and strips	2.22c	12 7 0††	1.44c	1,444	1.95c	1,300	2.29c	127

†British ship-plates. Continental, bridge plates. §24 ga. ‡1 to 3 mm. basic price. British quotations are for basic open-hearth steel. Continent usually for basic-bessemer steel. (a) del. Middlesbrough. 5s rebate to approved customers. (b) hematite. °Close annealed. ††Rebate of 15s on certain conditions. *†Belgian francs. **Gold pound sterling not quoted. §§Last prices, no current quotations.

IRON AND STEEL SCRAP PRICES

Corrected to Friday night. Gross tons delivered to consumers, except where otherwise stated; †indicates brokers prices

HEAVY MELTING STEEL

Birmingham, No. 1.	17.00
Bos. dock No. 1 exp.	17.50-18.00
New Eng. del. No. 1	18.00-19.00
Buffalo, No. 1	22.00-22.50
Buffalo, No. 2	20.00-20.50
Chicago, No. 1	19.50-20.00
Chicago, auto, no alloy	18.00-18.50
Chicago, No. 2 auto	15.50-16.00
Cincinnati dealers	16.50-17.00
Cleveland, No. 1	19.50-20.00
Cleveland, No. 2	18.50-19.00
Detroit, No. 1	†16.00-16.50
Detroit, No. 2	†15.00-15.50
Eastern Pa., No. 1	22.50-23.00
Eastern Pa., No. 2	20.00-20.50
Federal, Ill.	17.00-17.50
Granite City, R. R.	16.50-17.00
Granite City, No. 2	17.00-17.50
Los Angeles, No. 1	12.50-13.00
Los Angeles, No. 2	11.50-12.00
L. A., No. 1 f.a.s.	16.00-17.00
L. A., No. 2 f.a.s.	15.00-16.00
N. Y. dock No. 1 exp.	17.00
Pitts., No. 1 (R. R.)	25.50-26.00
Pittsburgh, No. 1	23.00-23.50
Pittsburgh, No. 2	22.50-23.00
St. Louis, R. R.	18.00-18.50
St. Louis, No. 2	17.00-17.50
San Francisco, No. 1	15.50-16.00
San Francisco, No. 2	14.50-15.00
Seattle, No. 1	14.50-15.50
Toronto, dirs. No. 1	10.00-10.50
Valleys, No. 1	21.00-21.50

COMPRESSED SHEETS

Buffalo, new	20.00-20.50
Chicago, factory	19.00-19.50
Chicago, dealers	18.00-18.50
Cincinnati, dealers	16.00-16.50
Cleveland	19.00-19.50
Detroit	†18.00-18.50
E. Pa., new mat	22.50-23.00
E. Pa., old mat.	19.50-20.00
Los Angeles	12.00-12.50
Pittsburgh	23.00-23.50
St. Louis	14.50-15.00
San Francisco	14.00-14.50
Valleys	20.50-21.00

BUNDLED SHEETS

Buffalo, No. 1	20.00-20.50
Buffalo, No. 2	17.50-18.00
Cleveland	15.00-15.50
Pittsburgh	22.50-23.00
St. Louis	13.00-13.50
Toronto, dealers	8.50- 9.00

SHEET CLIPPINGS, LOOSE

Chicago	14.00-14.50
Cincinnati dealers	11.50-12.00
Detroit	†13.00-13.50
St. Louis	12.00-12.50
Toronto, dealers	4.75- 5.25

BUSHELING

Buffalo, No. 1	20.00-20.50
Chicago, No. 1	18.00-18.50
Cincin., No. 1, deal.	12.00-12.50
Cincinnati, No. 2	5.50- 6.00
Cleveland, No. 2	12.50-13.00
Detroit, No. 1, new	†16.00-16.50
Valleys, new, No. 1	18.50-19.00
Toronto, dealers	4.25- 4.75

MACHINE TURNINGS (Long)

Birmingham	7.50
Buffalo	13.50-14.00
Chicago	12.00-12.50
Cincinnati, dealers	7.50- 8.00
Cleveland, no alloy	11.50-12.00
Detroit	†9.50-10.00
Eastern Pa.	14.50-15.00
Los Angeles	4.00- 5.00
New York	†6.50- 7.00
Pittsburgh	15.50-16.00
St. Louis	9.00- 9.50
San Francisco	5.00
Toronto, dealers	4.75- 5.25
Valleys	12.50-13.00

SHOVELING TURNINGS

Buffalo	15.00-15.50
Cleveland	12.50-13.00
Chicago	12.50-13.00
Chicago, spcl, anal.	13.50-14.00
Detroit	†12.50-13.00
Pitts., alloy-free	18.00-18.50

BORINGS AND TURNINGS
For Blast Furnace Use

Boston district	†6.75- 7.50
Buffalo	13.00-13.50
Cincinnati, dealers	6.50- 7.00
Cleveland	12.00-13.00
Eastern Pa.	13.00-13.50
Detroit	†9.50-10.00
New York	†3.50- 4.00
Pittsburgh	13.00-13.50
Toronto, dealers	4.00- 4.50

AXLE TURNINGS

Buffalo	18.50-19.00
Boston district	†10.50-11.00
Chicago, elec. fur.	19.50-20.00
East. Pa. elec. fur.	20.00-20.50
St. Louis	13.50-14.00
Toronto	4.50- 4.75

CAST IRON BORINGS

Birmingham	7.00- 7.50
Boston dist. chem.	†9.00- 9.50
Buffalo	13.00-13.50
Chicago	12.00-12.50
Cincinnati, dealers	6.50- 7.00
Cleveland	12.00-13.00
Detroit	†9.50-10.00
E. Pa., chemical	14.50-15.00
New York	†3.50- 4.00
St. Louis	9.00- 9.50
Toronto, dealers	4.25- 4.75

RAILROAD SPECIALTIES

Chicago	21.50-22.00

ANGLE BARS—STEEL

Chicago	21.50-22.00
St. Louis	21.00-22.00

SPRINGS

Buffalo	24.50-25.00
Chicago, coil	23.00-23.50
Chicago, leaf	21.50-22.00
Eastern Pa.	26.00-26.50
Pittsburgh	28.50-29.00
St. Louis	21.00-21.50

STEEL RAILS, SHORT

Birmingham	12.00-12.50
Buffalo	24.50-25.00
Chicago (3 ft.)	21.50-22.00
Chicago (2 ft.)	22.00-22.50
Cincinnati, dealers	23.50-24.00
Detroit	†24.50-25.00
Pitts., 3 ft. and less	28.50-29.00
St. Louis, 2 ft. & less	21.50-22.00

STEEL RAILS, SCRAP

Boston district	†15.50-16.00
Buffalo	22.00-22.50
Chicago	19.50-20.00
Cleveland	22.00-22.50
Pittsburgh	26.50-27.00
St. Louis	18.00-18.50
Seattle	18.00-18.50

FROGS, SWITCHES

Chicago	19.50-20.00
St. Louis, cut	18.00-18.50

ARCH BARS, TRANSOMS

St. Louis	20.00-20.50

PIPE AND FLUES

Chicago, net	13.50-14.00
Cincinnati, dealers	12.50-13.00

RAILROAD GRATE BARS

Buffalo	15.50-16.00
Chicago, net	12.75-13.25
Cincinnati, dealers	10.00-10.50
Eastern Pa.	18.50-19.00
New York	†13.00-13.50
St. Louis	13.00-13.50

RAILROAD WROUGHT

Birmingham	11.00-11.50
Boston district	†9.50-10.00
Eastern Pa., No. 1	22.50-23.00
St. Louis, No. 1	12.75-13.25
St. Louis, No. 2	17.50-18.00

FORGE FLASHINGS

Boston district	†12.25-12.75
Buffalo	20.00-20.50
Cleveland	18.50-19.00
Detroit	†15.50-16.00
Pittsburgh	21.00-21.50

FORGE SCRAP

Boston district	†7.00
Chicago, heavy	23.00-23.50

LOW PHOSPHORUS

Cleveland, crops	22.50-23.00
Eastern Pa., crops	26.00-26.50
Pitts., billet, bloom, slab crops	30.00-30.50

LOW PHOS. PUNCHINGS

Buffalo	23.00-23.50
Chicago	22.00-22.50
Cleveland	22.00-22.50
Eastern Pa.	26.50-27.00
Pittsburgh	25.50-26.00
Seattle	15.00
Detroit	†18.50-19.00

RAILS FOR ROLLING
5 feet and over

Birmingham	20.00
Boston	†17.00-17.50
Chicago	21.50-22.00
New York	†18.00-18.50
Eastern Pa.	24.00-24.50
St. Louis	20.00-20.50

STEEL CAR AXLES

Birmingham	20.00-21.00
Boston district	†18.50-19.00
Chicago, net	22.00-22.50
Eastern Pa.	25.00-25.50
St. Louis	22.00-22.50

LOCOMOTIVE TIRES

Chicago (cut)	21.00-21.50
St. Louis, No. 1	18.00-18.50

SHAFTING

Boston district	†18.50-19.00
New York	†18.00-18.50
Eastern Pa.	25.00-25.50
St. Louis, 1¼-3¾"	19.50-20.00

CAR WHEELS

Birmingham	13.50-14.00
Boston dist., iron	†15.00-15.50
Buffalo, steel	24.50-25.00
Chicago, iron	19.00-19.50
Chicago, rolled steel	22.00-22.50
Cincin., iron, deal.	19.00-19.50
Eastern Pa., iron	23.50
Eastern Pa., steel	26.00-26.50
Pittsburgh, iron	22.00-22.50
Pittsburgh, steel	28.50-29.00
St. Louis, iron	20.00-20.50
St. Louis, steel	21.00-21.50

NO. 1 CAST SCRAP

Birmingham	13.00-13.50
Boston, No. 1 mach.	†17.00-17.50
N. Eng. del. No. 2	17.50-18.50
N. Eng. del. textile	20.00-25.00
Buffalo, cupola	20.00-20.50
Buffalo, mach.	21.00-21.50
Chicago, agri. net	15.50-16.00
Chicago, auto net	16.50-17.00
Chicago, railroad net	16.50-17.00
Chicago, mach. net	17.00-17.50
Cincin., mach. deal.	19.50-20.00
Cleveland, mach.	20.00-21.00
Detroit, cupola, net	†16.50-17.00
Eastern Pa., cupola	24.00-25.00
E. Pa., mixed yard	20.00-20.50
Los Angeles, net	15.00-16.50
Pittsburgh cupola	22.50-23.00
San Francisco, del.	12.50-13.00
Seattle	16.00-16.50
St. Louis, cupola	17.00-17.50
St. Louis agri. mach.	17.00-17.50
St. L., No. 1 mach.	18.00-18.50
San Francisco	14.50-15.00
Toronto, No. 1, mach., net, dealers	15.00-15.50

HEAVY CAST

Boston dist. break.	†15.00-15.25
New England, del.	16.00-17.00
Buffalo, break.	17.50-18.00
Cleveland, break, net	15.00-15.50
Detroit, auto net	†17.50-18.00
Detroit, break.	†14.50-15.00
Eastern Pa.	22.00-22.50
Los Ang., auto, net.	14.50
New York, break	†16.00-16.50
Pittsburgh, break	19.00-19.50

STOVE PLATE

Birmingham	9.00-10.00
Boston district	†14.00-14.50
Buffalo	16.00-16.50
Chicago, net	12.50-13.00
Cincinnati, dealers	10.75-11.25
Detroit, net	†11.00-11.50
Eastern Pa.	18.50-19.00
New York, fdy.	13.00-13.50
St. Louis	12.00-12.50
Toronto dealers, net	9.00- 9.50

MALLEABLE

Birmingham, R. R.	14.00-15.00
New England, del.	11.50-12.50
Buffalo	22.50-23.00
Chicago, R. R.	22.00-22.50
Cincin., agri., deal.	16.00-16.50
Cleveland, rail	24.00-24.50
Eastern Pa., R. R.	22.00-22.50
Los Angeles	12.50
Pittsburgh, rail	24.00-24.50
St. Louis, R. R.	19.50-20.00

Ores

Lake Superior Iron Ore

Gross ton, 51½ %
Lower Lake Ports

Old range bessemer	$5.25
Mesabi nonbessemer	4.95
High phosphorus	4.85
Mesabi bessemer	5.10
Old range nonbessemer	5.10

Eastern Local Ore

Cents, unit, del. E. Pa.

Foundry and basic 56-63%, contract	9.00-10.00

Foreign Ore
(Prices nominal)

Cents per unit, c.i.f. Atlantic

Manganiferous ore, 45-55% Fe., 6-10% Mn.	14.00-15.00
North African low phos.	14.00
Spanish, No. African basic, 50 to 60%	nom.
Chinese wolframite, short ton unit, duty paid	$23.75-25.00
Scheelite, imp.	$25.00-26.00
Newfoundland fdry. 55%	7.00
Chrome ore, 48% gross ton, c.i.f.	$25.00-26.00

Manganese Ore

Prices not including duty, cents per unit cargo lots.

Caucasian, 50-52%	nom.
So. African, 50-52%	nom.
Indian, 49-50%	
Brazilian, 43-45%	nom.

Molybdenum

Sulphide concentrates, per lb. Mo. contained, mines	$0.75

—The Market Week—

Sheets, Strip

Sheet and Strip Prices, Pages 184, 185

Pittsburgh—Practically no new business in sheets and strip is being accepted except for shipment at prevailing prices. Price advances are expected to be announced this month. Delivery problems have become acute on some items but are alleviated slightly by automotive strikes. Sheet production is close to 80 per cent, with strip slightly better than 70 and galvanized at 78. Tight rolled cooperage hoop has been established on a separate base, divorcing it from the hot strip card. Base quotation is unchanged at 2.10c.

Chicago—Commoner grades of sheets and strip are completely sold out for the quarter, it is generally reported. Some orders for first quarter shipment are being taken at open prices, but such bookings are small. The automotive industry continues the largest outlet for flat-rolled. Farm equipment interests are taking larger lots.

Boston — While buying has lessened, considerable narrow cold strip is being placed for first quarter shipment at prices prevailing at time of delivery. Meanwhile, mills are operating near capacity and are pressed for deliveries. Sheet buying is light, but specifications against old orders are steady.

New York—Sold-up condition of mills is reflected in a decline in orders, although some tonnage has been booked for next quarter at open prices. Other buyers prefer to await the setting of prices before committing themselves. One of the smaller eastern mills is reported here to have advanced quotations $10 a ton on black and galvanized sheets.

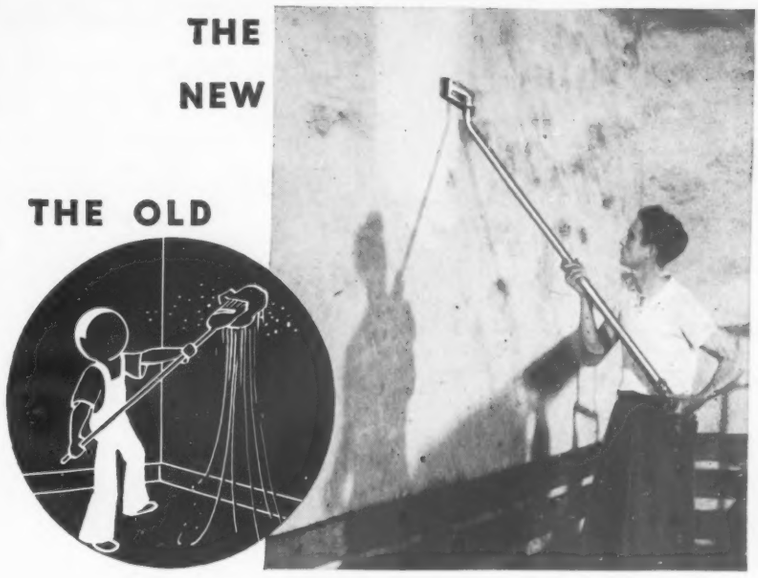
Philadelphia — Sheets continue available for fourth quarter delivery from some smaller mills at the $5 advance, but larger interests are practically out of the market for this period. A container maker is busy on a new beer can, bodies of which are stamped without seams from black plate in coils.

Birmingham, Ala.—Accumulation of some backlog is reported in sheets in southern territory. Production is at better than 80 per cent in both manufacturers and roofing sheets.

Plates

Plate Prices, Page 184

Pittsburgh—Plate business still is being accepted by some mills here. Prices have not been adjusted to follow the $5 increase instituted by



Cleaning Wall in Southern Tobacco Factory

Yesterday's Dirt is Today's Dust

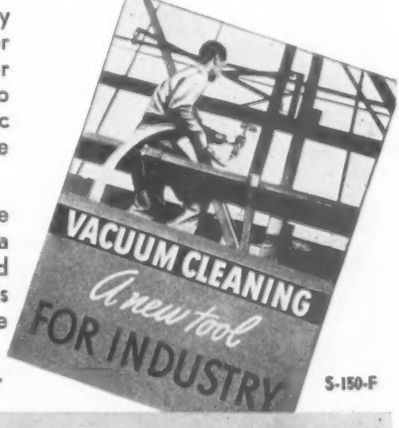
And **dust** is far more injurious to health, to goods in process, and can slow up production more seriously than dirt or debris, when it lodges in the wrong place.

Why not remove the dirt and litter as fast as it is produced and eliminate the source of dust? Why not have your plant as clean as a watch or a radio factory? In the long run it costs no more.

In fact, with Spencer Vacuum you can get top cleanliness at rock bottom costs. Here are some of the estimated savings reported: 25% on cleaning large floor areas; 50% on walls and overhead; 70% saving on the cost of cleaning machinery.

And because of the greater degree of cleanliness you practically eliminate rejects due to dirt, and you reduce fire, health and explosion hazards with every stroke of the powerful vacuum tool.

SPENCER STATIONARY VACUUM SYSTEMS piped like compressed air or water are becoming standard in the larger plants. Smaller companies and those desiring to test its advantages first are using Spencer Heavy Duty Portables. There's a little ¾ H.P. unit for light service. For ordinary debris, the Spencer 1½ H.P. unit is a favorite. Other units up to 7½ H.P. with dirt capacities up to 7½ cubic feet will meet your requirements in both price and performance.



444 users have been surveyed recently. The reports of their experience, together with a description of the various Spencer Units and a complete variety of industrial vacuum tools are given in Bulletin No. 120ST –yours for the asking.

SEE SPENCER AT THE METAL EXPOSITION, BOOTH NO. H-213.

S-150-F

SPENCER HARTFORD CENTRAL AND PORTABLE VACUUM CLEANING SYSTEMS

THE SPENCER TURBINE COMPANY, HARTFORD, CONN.

some producers, and the belief is no premium will be asked so long as capacity is available.

Boston—Larger plate consumers are covered this quarter at 2.10c, Claymont, Del., but an increasing volume of new business is being booked at higher prices. Such tonnage is relatively small, however.

New York—Shipbuilding requirements are outstanding, although heavy protections also are out on freight cars. Federal Shipbuilding & Dry Dock Co., Kearny, N. J., has been awarded eight C-2 boats involving 36,800 tons of steel, mostly plates. So far this year the maritime commission has ordered 95 vessels, taking 375,000 tons of steel. Other recent awards include eight C-2 boats, requiring 36,800 tons, to Sun Shipbuilding & Dry Dock Co. Plate deliveries are tightening, with additional tonnage being placed at $5 above the 2.29c, delivered New York, price.

Ship work under way or under contract Oct. 1 involved 179 vessels with a total gross tonnage of 1,044,580, a gain of 48.6 per cent compared with the tonnage Sept. 1 and 133 per cent more than a year ago, according to the American Bureau of Shipping.

Philadelphia—Buying has eased, but pressure for deliveries shows no abatement and, in fact, some difficulty is noted in providing consumers with sufficient tonnage to care for current requirements. Little or no tonnage is available for nearby delivery at less than 2.35c, Coatesville or Claymont.

Birmingham, Ala. — Substantial plate business is evident at mills here and at Gadsden. Railroad buying, together with miscellaneous purchases, have put production at above 80 per cent, the highest in several years. Backlogs are increasing.

San Francisco—Bids were rejected on a 103-inch welded steel or reinforced concrete pipe line for the Mono Craters tunnel and Grant Lake reservoir, Los Angeles, and the work is to proceed by force account, the city to buy the steel required as work progresses. To date this year 79,956 tons of plates have been booked, compared with 28,292 tons a year ago.

Seattle—While no large projects are up, fabricators report improved business in small lots, stimulated by seasonal repair work. Bellingham, Wash., has called bids Oct. 19 for a 72-inch welded steel pipe line, involving 125 tons or more, with alternate bids on wood stave.

Plate Contracts Placed

1860 tons, welded tanks, Magnolia Petroleum Co., Corpus Christi, Tex., to Chicago Bridge & Iron Co., Chicago.

160 tons, welded tanks, Magnolia Petroleum Co., San Antonio, Tex., to Chicago Bridge & Iron Co., Chicago.

Plate Contracts Pending

3000 tons, 103-in. welded steel or reinforced concrete pipe line, Mono Craters tunnel and Grant Lake reservoir, Los Angeles; bids rejected and work will be done by force account.

1145 tons, armor plate, for navy; bids Oct. 24.

150 tons, 317 welded nun and can buoys, bids Oct. 17, and 25 steel gas buoys, bids Oct. 20, superintendent of lighthouses, Staten Island, N. Y.

125 tons or more, alternate wood stave, water system intake for Bellingham, Wash.; bids Oct. 19; Baar & Cunningham, Portland, engineers.

Unstated tonnage, 150,000-gallon elevated steel tank, Fort Screven, Ga.; bids Oct. 24, quartermaster of post.

Unstated tonnage, welded steel hull and main deck-house, snag boat for United States engineer, Memphis, Tenn.; Bethlehem Steel Co. recommended for contract.

JESSOP'S
Sheffield Tool Steels

SPECIFIC APPLICATION STEELS

PROGRESSIVE steel companies devote so much care and thought to their products few can resist the temptation to talk about quality, scientific control, etc. The Jessops began pouring heats in 1774, and have been developing and making fine tool steels ever since; naturally, they could spend a great deal of time talking about tradition, superior quality, and reputation. William Jessop and Sons prefer, however, to let their products do the talking; and we would rather talk about the applications and economies of their good tool steels than repeat the story of their background. They suggest that you investigate these specific application steels: Superior Oil-Hardening Steel—(non-deforming tool and die steel); Alloy "C" Steel—(non-abrasive, non-deforming, high production); Albor Die Steel—(for stamping all hard metals); J-4 Chisel Steel—(for shock resisting tools); Carbon Crucible Cast Steel for Dies—(green and yellow label). Information costs nothing; write for details concerning these steels.

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121 VARICK STREET • NEW YORK • N•Y

Bars

Bar Prices, Page 184

Cleveland—New extra card on cold-drawn bars is looked for this week, the last of such revisions in both hot and cold bars in carbon and alloy grades. Mills are pushing production but are unable to accommodate additional business for shipment this quarter.

Boston—Except for heavier buying by government shops—Watertown, Mass., arsenal, 250 tons of carbon steel bars, and a Springfield, Mass., armory, several hundred tons of chromium - molybdenum stock—commercial bar demand is not active. Most distributors are well covered the remainder of the year and are specifying liberally. Alloys are moving steadily to shipyards, producers of bolt and nut specialties and small tool makers, and needs of the aircraft industry are rising.

Crucible Steel Co. of America is low on 500,000 pounds of carbon steel bars for the Watertown, Mass., arsenal, proposal 149.

New York—Demand continues to level off, most consumers being covered at least for the quarter and curtailing further buying until first quarter prices are announced. Some fair export orders for cold-drawn bars have been taken at around domestic levels. Some sellers of the latter still are offering shipments in five to six weeks.

Philadelphia — New buying has tapered, but little tonnage is available until late this year. Some talk is heard of a $3 to $5 advance in first quarter prices. Consumption has not kept pace with recent demand but is gaining.

Birmingham, Ala.—Bar bookings, especially merchant bars, are extremely active. Considerable tonnage is going to agricultural implement builders, and quite a bit of business is evident in concrete reinforcing bars.

Pipe

Pipe Prices, Page 185

Chicago—Cast pipe has had little share in recent improvement in iron and steel demand. PWA needs have disappeared entirely, but several WPA projects still are pending. Advancing prices for building material are believed contributing to some restriction of construction activity.

Boston — Merchant steel pipe demand is maintained in moderate volume, prices being somewhat steadier. Mill deliveries are fairly prompt. Cast pipe foundries have heavy backlogs for the balance of the year, many municipal water departments having increased annual contract releases just previous to the $3 advance in prices.

New York—Merchant pipe continues to move actively. Heating requirements are near the crest, but improved demand is appearing from railroads, public utilities and oil companies. Early delivery is available on merchant pipe, but line pipe shipments are extended as much as two months or more. Miscellaneous cast pipe buying continues active, although utility purchases have subsided since the price increase. Export inquiries are numerous.

Birmingham, Ala.—Several comparatively large bookings of pipe, mostly for public utility use, were reported the past week. In addition to the order recently received from Wichita, Kans., west coast cities have placed a fairly large tonnage here. Production remains on four and five days a week.

Seattle—Interest in cast pipe is

FOR HOT, HEAVY ROLLING . . .

STEEL PICKS PENOLA!

WITH steel temperatures up to 2,600° F. and roll neck pressures exceeding one million pounds, you've *got* to be sure of your lubricants. That's why most steel men pick Penola. They know Penola lubricants were made to stand up under conditions far tougher than any found in actual mill operation.

And with bearings costing over $5,000.00 each and forced shut-down time of a modern, continuous strip mill causing a loss of more than $100.00 per minute—proper lubrication is *important!* No wonder the majority of all roller bearing installations in steel mills of the U. S. and Canada are Penola-lubricated!

So it's easy to see why Penola produces and sells more steel mill lubricants than any other maker in the world. Consult Penola's lubrication engineers about *your* problems...it's a profitable habit!

PENOLA LUBRICANTS

Penola Inc., Pittsburgh, Pa. *(Formerly Pennsylvania Lubricating Co.)*

New York • Chicago • Detroit • St. Louis

LUBRICANTS FOR THE STEEL INDUSTRY SINCE 1885

improving, and dealers look for fair business this quarter. Tacoma has placed 100 tons of 18-inch with United States Pipe & Foundry Co. Bids are in on 230 tons for Vancouver, Wash., and 450 tons for Bremerton, Wash. Small orders are in prospect from Quincy and Tumwater.

Cast Pipe Placed

275 tons, 15,000 feet, various sizes, cement-lined, Panama, to United States Pipe & Foundry Co., Burlington, N. J., bids Sept. 25, schedule 3603.

100 tons, 18 inch, for Tacoma, Wash., to H. G. Purcell, Seattle, for U. S. Pipe & Foundry Co., Burlington, N. J.

Wire

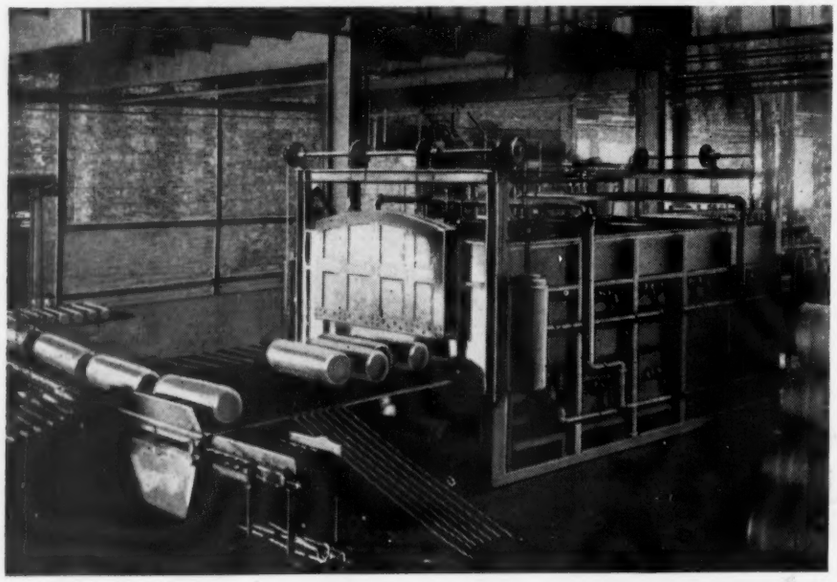
Wire Prices, Page 185

Chicago—Heavy backlogs require mills to study inquiries to determine whether shipment can be made before end of the year. First quarter bookings are being declined, pending establishment of prices for that period. Demand is widespread, needs of manufacturers' wire consumers being particularly heavy.

Boston—With wire mills operating near capacity in most departments, buying pressure has eased. Some scattered business is being taken for next quarter delivery at open prices. Merchant products which have been inclined to lag in this district also share mildly in the recent upturn.

New York—Bookings have slackened, producers being sold up on numerous items for this quarter. Some small tonnage is being taken for shipment after Dec. 31 at open prices. Some doubt is expressed that all tonnage booked for fourth quarter delivery will be cleared by the end of the year.

Birmingham, Ala. — Substantial wire business is being booked here and at Gadsden for immediate and first quarter delivery. Some backlog accumulation is reported, although mills are not particularly concerned, thus far, over delivery problems.



Science and Experience

CLASP HANDS ON THE Hackney METHOD

—For Your Benefit and Profit

The Hackney method is the result of painstaking, scientific research and more than 35 years of experience in developing and constructing containers and special shapes. It has aided many manufacturers in realizing increased profits, because of reduced costs, increased efficiency and savings in time.

Hackney began the cold drawing of seamless containers from metal plates. Where welding is desirable, the Hackney method has won recognition for its superiority. Positive control of heat treatment, X-ray control of welding, and numerous other Hackney procedures permit the production of better, more dependable products at lower cost.

A Hackney engineer may be the means of helping you to make big savings. He can aid you in developing new shapes or shells or improve on those now being used. Just send the details—or write for additional information.

PRESSED STEEL TANK COMPANY

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1461 S. 66th Street, MILWAUKEE

DEEP DRAWN SHELLS AND SHAPES

Rails, Cars

Track Material Prices, Page 185

Railroad markets continue active, with additional buying of freight cars and track material in prospect. More than 12,000 cars still are pending. Inquiries include 1800 for the Northern Pacific and 1500 for the Great Northern. The Santa Fe has placed 2800 cars of various types.

Rail orders are headed by 35,600 for the Northern Pacific. New York Central may buy 50,000 tons of rails, and the New Haven is in the market for 15,000 tons. Pittsburgh & Lake Erie opens bids Oct. 17 on fabricated parts for 55 and 70-ton hopper cars.

Car Orders Placed

Detroit, Toledo & Ironton, 25 seventy-ton covered hopper cars, to American Car & Foundry Co., New York.

General American Transportation Corp., 600 tank cars, to own shops.

Louisville & Nashville, 1200 freight cars; 600 each to American Car & Foundry Co., New York, and Pullman-Standard Car Mfg. Co., Chicago.

Nevada Consolidated Copper Co., 30 Austin Western Road Machinery Co., thirty-cubic yard air dump cars, to Aurora, Ill.

Santa Fe, 2800 cars, including 1800 box cars to Pullman-Standard Car Mfg. Co.; 450 refrigerator cars, 100 flat cars and 50 gondolas to General American Transportation Corp.; 200 gondolas to American Car & Foundry Co., which also will build 200 Santa Fe ballast cars for Rogers Ballast Car Co.

Seaboard Air Line, 700 steel box cars, to Pullman-Standard Car Mfg. Co., Bessemer, Ala., plant.

Locomotives Placed

Illinois Central, ten diesel-electric switch-

ing and transfer locomotives, to Electro-Motive Corp.

Rail Orders Placed

Bangor & Aroostook, 300,000 tie plates, to Bethlehem Steel Co.

Illinois Central, 7000 tons, in addition to 10,600 tons previously awarded. Divided as follows: 2500 tons each to Carnegie-Illinois Steel Corp. and Tennessee Coal, Iron & Railroad Co.; 2000 tons to Inland Steel Co.

Northern Pacific, 35,600 tons; 23,000 tons to Carnegie-Illinois Steel Corp., 10,000 tons to Bethlehem Steel Co., 2000 tons to Inland Steel Co., 600 tons to Colorado Fuel & Iron Co.

Car Orders Pending

Great Northern, 1500 seventy-five ton ore cars; bids asked.

Lehigh & New England, 100 seventy-ton cement cars, pending.

Lehigh Valley, 200-300 seventy-ton gondolas, 50 seventy-ton mill type gondolas.

Norfolk & Western, 1000 hopper cars.

Northern Pacific, 1800 box cars.

St. Louis & Southwestern, 100 coal cars, 50 automobile cars, 50 rebuilt flat cars, 12 cabooses and 6 new flat cars; court permission sought to build this equipment.

Utah Copper Co., 100 hundred-ton ore cars, pending.

War department, 125 gasoline tank cars; bids opened Oct. 10.

Rail Orders Pending

New York Central, possibly 50,000 tons plus accessories; bids Oct. 25.

New York, New Haven & Hartford, 15,000 tons plus accessories, contemplated, depending upon court approval; this is in addition to 15,000 tons of rail purchased earlier in year.

Buses Booked

The a.c.f. Motors Co., New York, has booked 32 coaches, powered with Hall-Scott horizontal engines, 12 being for the Harrisburg Railways, Harrisburg, Pa.; five for Des Moines Railroad Co., Des Moines, Ia.; four for Gary Railways, Gary, Ind.; four for Valley Transportation Co., LeMoyne, Pa.; three for South Eastern Greyhound Lines, Lexington, Ky.; two for Toye Bros., Yellow Cab Co., New Orleans, La.; two for Williamsport Transportation Co., Williamsport, Pa.; 25 for Philadelphia Rapid Transit Co.

Shapes

Structural Shape Prices, Page 184

Chicago—Construction work remains fairly steady, although mill backlogs of shapes and plates have increased materially the past few weeks. Largest of recent awards include 3830 tons for two sections of the Chicago subway and 1250 tons for a power plant expansion at Milwaukee. Bridge work is active

Boston—Structural orders of 1000 tons are made up of relatively small lots. Awards include 305 tons for cranes, Boston navy yard, placed with a Detroit shop, the same fabricator having taken close to 2400 tons in New England the last two weeks. Plain material is firmer, but New England fabricators generally are buying only for work already booked.

Philadelphia — Although several fair-sized jobs remain to be placed, volume of new work has slackened. Prices on fabricated material have advanced $5 to $7 a ton the past few weeks but remain $3 to $5 under the market. Plain shapes are firm at 2.10c, Bethlehem, with an independent quoting 2.35c on small lots.

Pittsburgh—Contracts are fairly numerous, with private work predominating. Public construction is less active among new inquiries. A number of railroad bridges are pending, including 1500 tons for the Nickel Plate at Conneaut, O.

Birmingham, Ala. — While there has been a moderate increase in shape bookings, volume remains considerably below that of other major steel products. Fabricators are busy but mostly on railroad and ship work.

San Francisco—While demand for structural material is less active than for most other steel products, a few fair sized lots were placed recently, totaling 1761 tons. These bring the year's aggregate to 118,502 tons, compared with 123,589 tons a year ago. Included are 650 tons for an addition to the Vultee Aircraft Co., Downey, Calif., in addition to 250 tons of corrugated sheets, and 600 tons for an addition to the plant of North American Aviation Inc., Los Angeles, plus 100 tons of corrugated sheets.

Seattle — Awards are headed by 1500 tons for the Lewis river bridge to Poole & McGonigle and 200 tons of piling for the same project to Columbia Steel Co. Colonial Construction Co. is low for the White Salmon river bridge, taking 117 tons of shapes and 23 tons of reinforcing bars.

Shape Awards Compared

	Tons
Week ended Oct. 14	**19,927**
Week ended Oct. 7	**25,063**
Week ended Sept. 30	**24,224**
This week, 1938	**10,294**
Weekly average, year, 1938	**21,568**
Weekly average, 1939	**22,695**
Weekly average, September	**27,395**
Total to date, 1938	**812,732**
Total to date, 1939	**930,513**

Includes awards of 100 tons or more.

Shape Contracts Placed

3380 tons, sections S3 and D1, Chicago subway, to American Bridge Co., Pittsburgh.

1700 tons, Washington state Lewis river bridge; 1500 tons to Poole & McGonigle, Portland, Oreg., 200 tons of piling to Columbia Steel Co., Portland; MacRae Bros., Seattle, general contractor.

1410 tons, apartment building, Sixty-ninth street and Fifth avenue, New York, to Harris Structural Steel Co., New York.

1250 tons, power plant expansion, Milwaukee, to Milwaukee Bridge Co., Milwaukee.

1130 tons, building, Pennsylvania Bell Telephone Co., Philadelphia, to Lehigh Structural Steel Co., Allentown, Pa.

750 tons, government hangar, shops and annex Kelly Field, San Antonio, Tex., to Bethlehem Steel Co., Bethlehem, Pa.

700 tons, route 6, section 12, Passaic river bridge, Montville, N. J., to Bethlehem Steel Co., Bethlehem, Pa., through Gray Construction Co., Morristown, N. J.

665 tons, public school 18, Buffalo, to Bethlehem Steel Co., Bethlehem, Pa.; Metzger Construction Co., Buffalo contractor.

650 tons, addition to Vultee Aircraft Co., Downey, Calif., to Consolidated Steel Corp., to Los Angeles.

600 tons, addition to North American Aviation, Inc., Los Angeles, to Bethlehem Steel Co., Los Angeles.

415 tons, including 172 tons sheet piling, Arickaree river bridge, Yuma county, Colorado, to unnamed interest.

400 tons, Broadway-Michigan building repairs, Milwaukee, to Milwaukee Bridge Co., Milwaukee.

375 tons, overhead conveyor bridge, Westinghouse Electric & Mfg. Co., Mansfield, O., to Mansfield Steel & Erecting Co.

350 tons, building, Linde Air Products Co., Duquesne, Pa., to American Bridge Co., Pittsburgh.

350 tons, tank building 1, Pittsburgh Plate Glass Co., Ford City, Pa., to Pittsburgh Bridge & Iron Works, Rochester, Pa.

310 tons, incinerator, Pittsburgh, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

305 tons, crane structures, navy yard, Boston, to R. C. Mahon Co., Detroit.

300 tons, federal court and customs house, Mobile, Ala., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, Alsea river state bridge, Oregon, to unstated Portland fabricator; Sig Ash, Portland, general contractor.

300 tons, piling, Dow Chemical Co. plant, Midland, Mich., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, bearing piles, Santa Fe railway bridge, Canadian, Tex., to Bethlehem Steel Co., Bethlehem, Pa.

285 tons, loading shed, Chicago, to Gage Structural Steel Co., Chicago.

275 tons, Montgomery Ward & Co., mail order building, Chicago, to Gage Structural Steel Co., Chicago.

262 tons, state highway bridge, Wamsutter, Wyo., to Des Moines Steel Co., Des Moines, Iowa.

260 tons, bridge CWR-189-2-1, Red River county, Texas, to Mosher Steel Co., Dallas.

250 tons, Edgar Allen Poe housing project, Baltimore, to Bethlehem Steel Co., Bethlehem, Pa.; Consolidated Engi-

neering Co., Baltimore, contractor; Dow-Weld Co., Baltimore, awarded 600 tons, reinforcing bars.

230 tons, bridge B1 of 26-1-3, Beaverton, Mich., to R. C. Mahon Co., Detroit.

205 tons, warehouse, Pisgah Forest, N. C., to Dave Steel Co., Asheville, N. C.

200 tons, two highway bridges, Greenpoint avenue, Brooklyn, N. Y., for city, to American Bridge Co., Pittsburgh.

180 tons, factory addition, Mueller Brass Co., Port Huron, Mich., to Gabriel Steel Co., Detroit.

175 tons, building 5, Rome Cable Co., Rome, N. Y., to Syracuse Engineering Co., Syracuse, N. Y.

150 tons, overpass, Tobyhanna, Pa., for state, to American Bridge Co., Pittsburgh.

150 tons, church building, Episcopal diocese, Newark, N. J., to Albert Smith & Sons, Irvington, N. J.

150 tons, building, Episcopal Diocese of Newark, Newark, N. J., to Albert Smith Sons, Irvington, N. J.

130 tons, two 130-foot truss spans, Crabtown, Ia., to Clinton Bridge Works, Clinton, Ia.

125 tons, South End Boys' club building, Boston, to A. O. Wilson Structural Co., Boston.

125 tons, three pumping stations, United States engineer, Baltimore, to Anthracite Bridge Co., Scranton, Pa., through B. G. Coon Construction Co., Luzerne, Pa.

120 tons, foundation caissons, East river drive, Fifty-fourth to Sixty-fourth streets, New York, to Turi Engineering Co., New York.

120 tons, Hosler-Trojan plant building, Troy, N. Y., to Lehigh Structural Steel Co., Allentown, Pa.

120 tons, addition to chapter house, American Red Cross, New York, to Bethlehem Steel Co., Bethlehem, Pa.

115 tons, bridges, Selma and Urania, La., for Missouri Pacific railroad, to Missouri Bridge & Iron Co., St. Louis.

110 tons, bridge No. 620, Grant county, Wisconsin, to Milwaukee Bridge Co., Milwaukee.

100 tons, seven beam spans, Brattleboro, Vt., to Vermont Structural Steel Co., Burlington, Vt.

100 tons, agricultural department buildings, New Orleans, to Jones & Laughlin Steel Corp., Pittsburgh; A. J. Rife Construction Co., Dallas, Tex., contractor. Laclede Steel Co., St. Louis, awarded 59 tons, reinforcing steel.

100 tons, bridge, Mahaska county, Iowa, to Pittsburgh-Des Moines Steel Co., Pittsburgh.

100 tons, 99-foot I-beam bridge, Grafton street, Chester, Vt., to Bethlehem Steel Co., Bethlehem, Pa.; M. J. Burrington, Jr., Bennington, Vt., contractor. Reinforcing awarded Albany Steel & Iron Supply Co., Albany, N. Y.

WIRE

Round + Flat + Square
Straightened and Cut
Shape Wire

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HIGH CARBON SPRING
LOW CARBON BASIC AND BESSEMER
OIL TEMPERED
WELDING WIRE RODS AND COILS

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Sizes ½" to No. 40 WM Gauge (.007)—All Finishes

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Wire for Practically All Purposes
and Requirements
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Highest Quality and Service Guaranteed

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Established 33 Years

IRON STEEL WIRE "SENECA" QUALITY SERVICE TRADE MARK

FLAT COLD ROLLED
STRIP STEEL

The Seneca Wire & Mfg. Company
Fostoria, Ohio

Representatives and Warehouses in practically all principal cities

Shape Contracts Pending

1600 tons, bridge, Glendale boulevard, Los Angeles, for city.

1500 tons, rebuilding bridge 115.19, Conneaut, O., New York, Chicago & St. Louis railroad.

800 tons, addition to power house, Central Illinois Light Co., East Peoria, Ill.

700 tons, powder and ammunition magazines, Savanna, Ill., for U. S. government.

650 tons, Driscoll hotel, Corpus Christi, Tex., for Mrs. Clara Driscoll.

600 tons, warehouse, for National Sugar Refining Co., Long Island City, N. Y.

600 tons, state bridge RC-2576, Cheektowaga, N. Y.

600 tons, warehouse, National Refining Co., New York.

600 tons, viaduct, Brompton, Iowa, Chicago, Milwaukee, St. Paul & Pacific railroad.

550 tons, bottling plant and office building, Beverwyck Breweries, Albany, N. Y.

400 tons, General Electric Realty Corp., warehouse and shop, Chicago; bids October 17.

400 tons, skating rink, for Victor J. Brown, Newark, N. J.

385 tons, beam bridge, Crane, Mo.; bids in.

350 tons, post office and federal building; Lincoln, Nebr.; bids in.

350 tons, F. W. Woolworth building, Seattle; bids in to J. B. Warrack Construction Co., Seattle, general contractor.

300 tons, including 120 tons, channels and 90 tons each angles and I-beams, Norfolk, navy yard; three bidders each quoted 2.40c, delivered, Sept. 20 sch. 7226, bureau of yards and docks.

300 tons, bridge, Thompson, N. Dak.-Crookston, Minn., for state of Minnesota.

300 tons, viaduct, Mapleton, Iowa, Chi-

cago, Milwaukee, St. Paul & Pacific railroad.

250 tons, state bridge RC-4078, Oswego, N. Y.

200 tons, state bridge 5793, Minnesota City, Minn.

200 tons, bridge, Medford, Minn., Chicago, Milwaukee, St. Paul & Pacific railroad.

200 tons, building, for Samuel P. Herkowitz, Albany, N. Y.

150 tons, subway section, S-9a, Chicago; bids Oct. 26.

120 tons, extension to postoffice, Plainfield, N. J.

120 tons, plant addition, Armstrong Cork Co., South Braintree, Mass.

120 tons, 158-foot, two-span, wide flanged beam bridge, Londonderry, Vt.; Lockwood-Young Corp., Concord, N. H., contractor, $31,843.70, bids Oct. 6, Montpelier.

117 tons, also 23 tons of reinforcing bars, Washington state bridge over White Salmon river, Klickitat county; Colonial Construction Co., Spokane, Wash., low at $26,414.

110 tons, theater, Williamstown, Mass.

110 tons, alterations to rack and wash house, for John F. Trommer, Brooklyn, N. Y.

108 tons, 132-foot, three-span continuous deck plate girder bridge and 84-foot single span, wide flanged beam bridge, Ludlow-Mt. Holly, Vt.; Bennington Construction Co, Bennington, Vt., contractor, $59,930.85, bids Oct. 6, Montpelier.

Unstated, water system intake, alternates for timber, Bellingham, Wash. bids Oct. 19.

Reinforcing

Reinforcing Bar Prices, Page 185

New York—Largest pending project is 4000 tons for the Vladeck housing project, New York, but smaller jobs are fairly numerous. Prices are the firmest in recent years, and several eastern producers have raised quotations up to $5 a ton for delivery this quarter.

Pittsburgh—Without formal announcement, concrete bar sellers have raised prices $5 a ton to 2.15c. This is the same price as merchant bars. In some cases as high as 2.35c has been quoted on reinforcing bars, reflecting lack of available mill capacity.

Chicago—Michael Pontarelli & Son, Chicago, are low on the general contract for the local filtration plant, requiring 12,000 tons of bars. Section S-9A of the Chicago subway, taking 400 tons, is up for bids. Ten subway sections have been let, with 13 yet to come. Billet and rail steel bar prices have been advanced $5 a ton.

Boston—Part of 450 tons for Connecticut highway and bridge needs bid Oct. 2 has been placed by two contractors, a substantial volume being mesh. While some housing projects in New England have been rejected, such work pending in the Boston area approximates 3000 tons. Prices are firmer, both rail and billet, but on large tonnages competition brings out some mild concessions.

Philadelphia—Makers of both new billet and rail steel bars have advanced prices $5 a ton to 2.15c base. New business is quiet. Considerable tonnage remains to be

Concrete Bars Compared

	Tons
Week ended Oct. 14	**11,081**
Week ended Oct. 7	**12,054**
Week ended Sept. 30	**12,133**
This week, 1938	**9,270**
Weekly average, year, 1938	**6,959**
Weekly average, 1939	**9,793**
Weekly average, September	**9,002**
Total to date, 1938	**273,366**
Total to date, 1939	**401,539**

Includes awards of 100 tons or more.

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Sleeve BEARING HEADQUARTERS
550 S. MILL STREET • NEW CASTLE, PA.

placed for the Harrisburg-Pittsburgh toll road but will not become active for two or three months, it it reported.

Seattle—Heavier business is anticipated later this quarter, and fabricators and warehouses are replenishing stocks. The week's awards of 600 tons were made up of 500 tons for the Lewis river bridge and 100 tons for a local store building.

San Francisco — Awards of 3569 tons brought the aggregate for the year to 134,800 tons, compared with 111,594 tons a year ago. Outstanding lettings included 1138 tons for the treasury department, Los Angeles, 500 tons for a state highway office building in Los Angeles and 225 tons for the Coalinga boulevard bridge, same city. Pending business is less than 4000 tons.

Reinforcing Steel Awards

1138 tons, treasury department, A 9564, List 717, Los Angeles, to Bethlehem Steel Co., Los Angeles.

800 tons, building, Kroger Grocery & Baking Co., Cincinnati, O., to Pollak Steel Co., Cincinnati; Morton C. Tuttle Co., Boston, contractor.

750 tons, St. Mary's hospital, Rochester, Minn., to Bethlehem Steel Co., Bethlehem, Pa.; McGough Bros., contractor.

605 tons, circumferential highway, Queens, contract MS-39-14, to Bethlehem Steel Co., Bethlehem, Pa., through Johnson, Drake & Pipe Inc., New York.

550 tons, Kingston culverts, Wilkes-Barre, Pa., for army engineers, to Truscon Steel Co., Youngstown, O.; Ralph Meyers, Salem, Ind., contractor.

500 tons, Washington state Lewis river bridge, to Soule Steel Co., Portland, Ore.; MacRae Bros., Seattle, general contractor.

500 tons, office building for state highway department, Los Angeles, to Soule Steel Co., Los Angeles.

500 tons, Latonia Terrace housing, Covington, Ky., to Truscon Steel Co., Youngstown, O.; Whittenberg Construction Co., contractor.

486 tons, Arkansas state letting, to Jones & Laughlin Steel Corp., Pittsburgh.

385 tons, including 97,300 square yards wire mesh and 44 tons bars, state highway project RC-4076, Washington county, New York, to Truscon Steel Co., Youngstown, O., through Construction Sales Co., Albany; E. J. Maney Co. Inc., Somerville, Mass., general contractor, $379,966, bids Sept. 20, Albany.

320 tons, three pumping stations, United States engineer, Baltimore, to Bethlehem Steel Co., Bethlehem, Pa., through B. G. Coon Construction Co., Luzerne, Pa.

300 tons, pumping station, Grand Rapids, Mich., to Bethlehem Steel Co., Bethlehem, Pa.

300 tons, Mt. Washington reservoir, Cincinnati, O., to Pollak Steel Co., Cincinnati; Ferro Concrete Construction Co., contractor.

276 tons, shipway improvements, navy yard, Brooklyn, N. Y., to Truscon Steel Co., Youngstown, O., through I. B. Miller Contracting Corp., New York.

250 tons, addition to state prison, Walla Walla, Wash., to Truscon Steel Co., Portland, Ore.; previously reported to unstated.

230 tons, road work, Lycoming county, Pennsylvania, to Bethlehem Steel Co., Bethlehem, Pa.

225 tons, Coalinga boulevard bridge, Los Angeles, to Soule Steel Co., Los Angeles.

200 tons, extension to Fourteenth street viaduct, Hoboken, N. J., to Bethlehem Steel Co., Bethlehem, Pa., through Joseph P. Scanlon Co., Jersey City, N. J.

200 tons, mesh and bars, bridge, New London, Conn., to Truscon Steel Co., Youngstown, O., through A. L. Savin Construction Co., Hartford, Conn.

195 tons, public school 18, Buffalo, N. Y., to Bethlehem Steel Co., Bethlehem, Pa.; Metzger Construction Co., Buffalo, contractor.

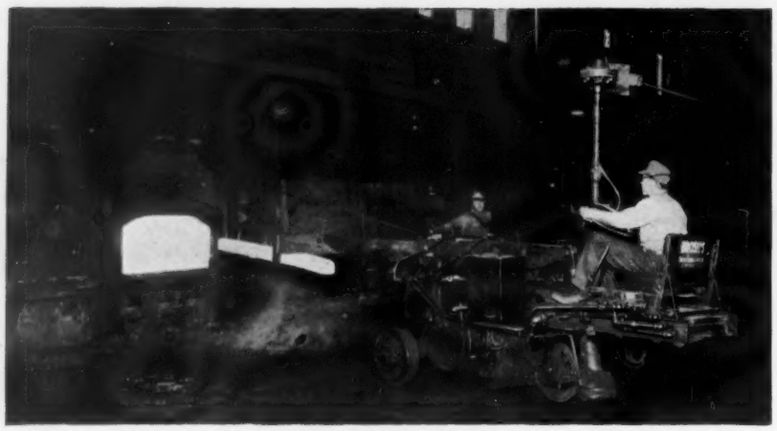
179 tons, bridges and highway work, Coos, Columbia, Lane and Linn county, Oregon, to unnamed interest.

175 tons, Rickel malt silos, Detroit, to Joslyn Mfg. & Supply Co., Chicago.

156 tons, remodel approach to Willamette river bridge, Clackamas county, Oregon, to unnamed interest.

150 tons, hangars and shop additions, Kelly Field, Texas, to Austin Bros., Dallas; Robert E. McKee, El Paso, engineer and contractor.

150 tons, viaduct, Sixth street, Cincinnati, O., to Pollak Steel Co., Cincinnati; J. R. Crew, contractor.



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are designed to serve heating furnaces, open hearth furnaces, mills, hammers, presses, etc. Adapted to operate in restricted areas, they can be turned on their own wheelbase. These machines are self contained and require no tracks or runways. Capacities run from 2,000 to 10,000 pounds.

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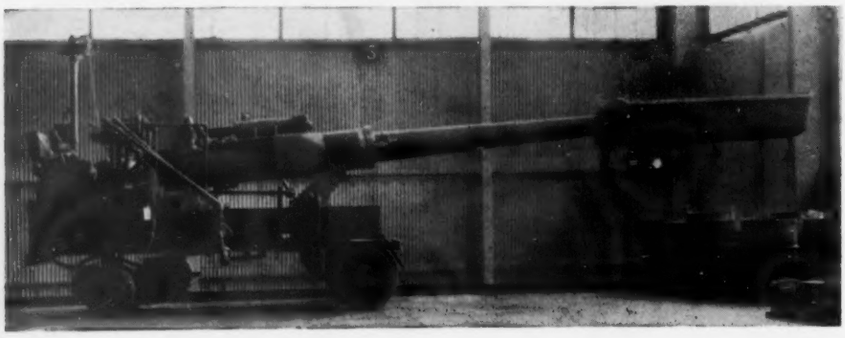

130 tons, mostly mesh, state highway project, Waterford, Conn., to Bethlehem Steel Co., Bethlehem, Pa.; Arute Bros., Inc., New Britain, Conn., contractor, bids Oct. 2, Hartford.

130 tons, box sewer, Milwaukee, Wis., to Youngstown Sheet & Tube Co., Youngstown, O.; through Worden-Allen Co., Milwaukee.

130 tons, bridge, route 5, Normal, Ill., to Laclede Steel Co., St. Louis; Robert Gibbons, contractor.

125 tons, highway project, West Stockbridge, Mass., to Truscon Steel Co., Youngstown, O., through Mario Pandolf Co. Inc., Needham Heights, Mass., contractor, at $144,157.

125 tons, sewage treatment plant, Cuyahoga Falls, O., to Pollak Steel Co., Cincinnati; Steinle-Wolfe Co., contractor.

116 tons, bridge, Farmington river, Barkhamsted, Conn., to Truscon Co., Youngstown, O., through A. I. Savin Construction Co., Hartford, Conn.

105 tons, three state bridges, New Hampshire, to Concrete Steel Co.

100 tons, building, Kroger Grocery & Baking Co., Columbus, O., to Pollak Steel Co., Cincinnati; C. M. Barr & Co., contractor.

100 tons, F. W. Woolworth building, Seattle, to Bethlehem Steel Co., Seattle.

100 tons, assembly hall, Emerson junior high school, Los Angeles, to unnamed interest.

100 tons, city hall, Kelso, Wash., to unnamed interest.

100 tons, College of Mines, University of Arizona, Tucson, Ariz., to unnamed interest.

100 tons, library addition, Glendale, Calif., to unnamed interest.

100 tons, sub-assembly shop, Portsmouth, Va., United States bureau yards and docks, to Virginia Steel Co., Norfolk, Va., through Ralph S. Herzog, Philadelphia.

Reinforcing Steel Pending

12,000 tons, east substructure, city filtration plant, Chicago; Michael Pontarelli & Son, Chicago, low on general contract.

4000 tons, superstructure, Vladeck housing project, New York.

600 tons, government powder magazines, Savannah, Ill.

500 tons, Laurel Homes housing Cincinnati.

500 tons, cell blocks 9 and 10, Green Haven, N. Y.

400 tons, Chicago subway section S-9a; bids Oct. 26.

400 tons, bridge, Russell, Kans.

400 tons, housing project, Peoria, Ill.; bids in.

400 tons, housing project, Lexington, Ky.

399 tons, Mono Craters tunnel and Grant Lake reservoir, specification 2952, Los Angeles; bids rejected and work will be done by force account.

350 tons, sewage plant, Omaha, Nebr.

325 tons, sewage treatment, Belleville, Ill.; Hoeffken Bros., Belleville, Ill., low.

316 tons, paint shop and transformer buildings, Mare Island, Calif., navy yard; MacDonald & Kahn Inc., San Francisco, low on general contract at $217,712.

270 tons, for tunnel, University of Illinois, Champaign, Ill., Aymen Construction Co., Chicago, low.

250 tons, non-commissioned officers quarters, Hickam Field, T. H.; Tucker McClure, 704 South Spring St., Los Angeles, low on general contract.

167 tons, housing project, Harrisburg, Pa.; Ritter Bros., Harrisburg, low.

125 tons, branch exchange, Illinois Bell Telephone Co., Marquette road, Chicago.

100 tons, building, Climax Molybdenum Co., Climax, Col.

100 tons, seawall, Starved Rock, Ill.

100 tons, building for Sears, Roebuck & Co., Seattle; bids in.

100 tons or more, state bridge Bitter Root river, Montana; bids at Helena, Oct. 19.

100 tons, landing mat additions, Hickam Field, T. H.; Hawaiian Contracting Co., Honolulu, low at $208,841.

Pig Iron

Pig Iron Prices, Page 186

Pittsburgh—Most blast furnaces now are assured of a constant coke supply. By-product ovens are op-

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JESSOP OFFERS A COMPLETE LINE OF:

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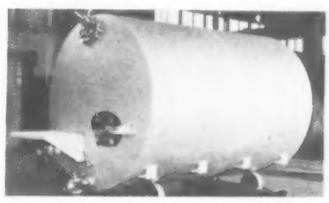
Saves up to 45% on material costs . . . easily fabricated . . . combines the protection of solid stainless with many of the advantages of mild steel. Used on widely varying types of equipment from household appliances to heavy structures as illustrated at right.



Typical food vessel fabricated from SILVER-PLY

Conduit lining for dam. Constructed from SILVER-PLY by the Treadwell Construction Company

JESSOP STEEL COMPANY

WASHINGTON, PENNSYLVANIA

erating full, with additional beehive units going into service. Last week showed an increase of nearly 600 active beehive ovens to a total of more than 4000. Pittsburgh Steel Co. has blown in its No. 2 stack.

Chicago—Shipments are 150 per cent ahead of last month, some interests estimate. Better criterion of improved foundry operations is the fact shipments of by-product foundry coke are approximately 40 per cent improved. Orders have decreased rather sharply, but bookings still are being made at $23.

Boston — High prices for cast scrap and a greatly improved melt, notably in Connecticut, continue to stimulate pig iron buying. Numerous foundries on a two-three day schedule early last month are now operating five days weekly, including most jobbing shops. Export inquiries are numerous, and considerable tonnage is available at premiums over domestic prices.

New York—A tapering in foreign pig iron demand, induced by higher export prices and peace talk, may be only temporary in view of latest European developments and abandonment of the English import duty on iron. Domestic shipments are steady.

Philadelphia—The melt continues to increase, with the average now probably close to 65 per cent. Smaller shops, until recently producing only a few heats weekly, are faring better.

Buffalo—Heavy production of pig iron finds local coke supplies inadequate, and shipments of Canadian fuel here are expected to start this week. This is said to be the first time Buffalo plants have found it necessary to import coke from Canada. Expansion in pig iron shipments shows no signs of abating.

Cincinnati—The rush to take in low-price iron and build up inventories has subsided somewhat, shipments now being more closely keyed to current needs. Consumption is expanding gradually.

St. Louis—Shipments are heavier than a month ago, aided by the increased proportion of iron in the melt. The latter is the outgrowth of high scrap prices. Some first quarter inquiry is appearing, but little tonnage has been placed. Expansion in foundry operations is general.

Birmingham, Ala.—The district's 18 blast furnaces continue to turn out every ton of pig iron possible to meet demand, both for merchant iron and steelmaking. Iron ore mines are operating 100 per cent.

Toronto, Ont.—Sales are confined to spot business, most melters being covered for the quarter. The melt has expanded steadily, now averaging about 70 per cent. Production of munitions is expected to stimulate demand further. Seven blast furnaces are active.

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DAMASCUS STEEL CASTING CO.
New Brighton, Pa.
(Pittsburgh District)

Scrap

Scrap Prices, Page 188

Pittsburgh—Definite weakness has appeared in both mill and broker prices, with No. 1 steel down $1. Mill buying of this grade has been done at about $23. Brokers are offering $21 and, although meeting some opposition, are able to secure fair tonnage. Dealer buying prices also are lower. The tone in grades other than open-hearth scrap is weaker, but prices generally are unchanged.

Cleveland — Price changes are mixed, heavy melting steel at Cleveland showing little change but Youngstown district quotations having softened the last few days.

Some short rails on recent railroad lists are reported to have gone to second hands at around $19 to $19.50. Quality scrap, aside from railroad material, is difficult to obtain in satisfying quantities.

Chicago—The market is quieter, with lower buying prices evident among brokers. The consumers' market for No. 1 steel continues $19.50 to $20 on the basis of last mill purchases. Some other grades are easier, including rails.

Boston — While several grades have risen an additional 50 cents to $1, the market appears to be leveling off. This is accompanied by some slackening in demand, notably for export. Uncertainty and lack of shipping besets buying for export, although prices are higher. Inquiry for No. 1 machinery cast is heavier, and around $20, delivered, has been paid at several points.

New York—Reaction has appeared in prices, a number of grades for domestic shipment being off an average of 50 cents. Demand also has declined. Buying for export continues, with bulk of material going to Japan. Cargo space to Europe is still limited. Export prices paid by brokers are slightly lower.

Philadelphia—Market has leveled off with prices tending no higher and supplies slightly freer. Resumption of export buying, however, may prevent development of much weakness. Buying for cargo scheduled for Europe is at $20.50 for No. 1 and $19 for No. 2.

Buffalo—Mixed tendencies have appeared in the market, but a new sale of a moderate tonnage substantiates the prevailing range of $22 to $22.50 for No. 1 steel. The consumer who earlier purchased about 40,000 tons on the basis of this range has withdrawn from the market. The first 5000 tons of a 30,000-ton contract for boat shipment has arrived from Duluth.

Detroit—With scrap offerings increasing, prices of most grades are definitely weaker by 50 cents to $1.50. Melters look for still lower prices, although continued heavy consumption supports the market.

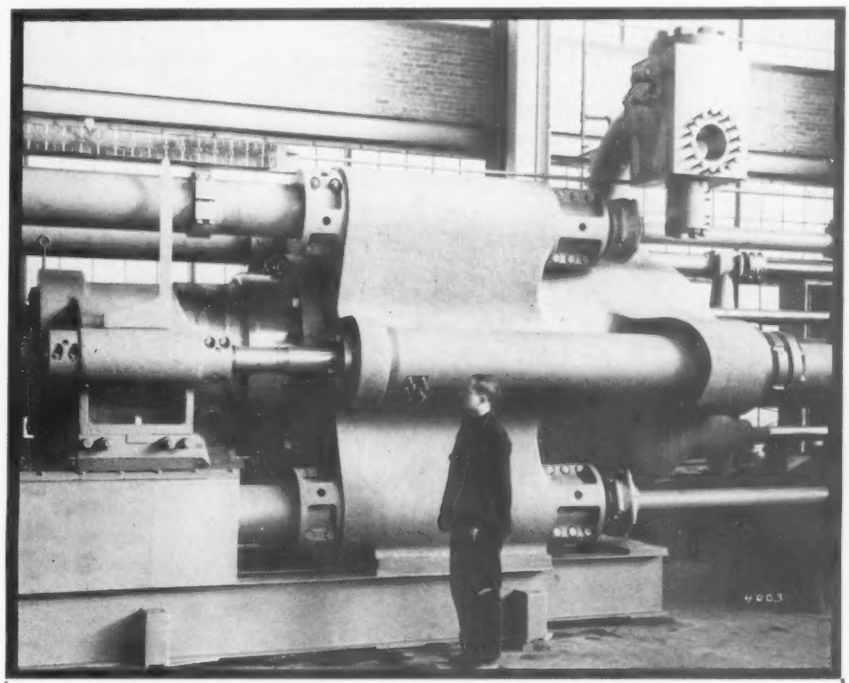
Cincinnati — Quotations are unchanged, and considerably more scrap is being made available from dealers' yards and other sources. Speculative sentiment has moderated and although no definite weakness has appeared, holders of scrap are more inclined to sell.

St. Louis — The market has a slightly easier tone, following six weeks of rapidly rising prices. Offerings are heavier from the country although still not excessively so, since dealers encounter difficulty in covering contracts. One local mill has bought 10,000 tons of No. 2 steel at current prices.

Birmingham, Ala.—A marked upturn is evident in prices of major scrap grades, particularly heavy melting steel and No. 1 cast. Foundries and steelworks both are taking large tonnages.

Los Angeles—Scrap prices, which soared the past few weeks, have receded, and No. 1 heavy melting steel, delivered plant, now holds at $12.50 to $13, while material for export is $16 to $17 f.a.s. Activity in the export market, primarily to Japan, has fallen off to some extent. No. 1 cast scrap, Los Angeles holds at $15 to $16.50 a ton while auto cast is $14.50. Compressed sheets now hold at $12 to $12.50, off $2.

Seattle — Sales are restricted by scarcity of stocks at tidewater. Dealers are paying $14.50 to $15.50 for No. 1 steel, while export levels range from $18 to $19, or $2.50 to $3.50 more than a month ago. Doubling of trans-Pacific freights is reflected in at least a 50 per cent



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Behind the Scenes with STEEL

Preview DeLuxe

■ This week we lay in your lap the best Metal Show issue STEEL has ever produced. The special insert section is the result of long hours and hard work by Engineering Editor Erle Ross (Purdue '17) and staff and it will be worth all the time you can spend with it bringing yourself up to date on recent developments in the production, fabrication and treatment of metals. To read through the 18 pages of contributions by top notch authorities in every branch of the industry is a liberal education in itself and the picture section takes you on a personal tour of plants throughout the country to give you a close up of what's new and different that you should know about. Certainly all of this will whet your appetite for a jaunt to Chicago next week and when you get there don't forget to stop by and see us in our fancy new booth, B-133.

Mental Workout

■ We wish those mathematicians who explained to us where the other dollar went last week would wear a few pencils out on this one: For how many seconds must the clicking of rails under a train be counted, so that the number of rails counted equals the speed of the train per hour, a rail being 30 feet long? (Guaranteed to drive you nuts.)

English War Songs

■ *The London Times* reports that the adaptation of peacetime to war conditions is a subject for much amiable controversy to the British. Not particularly perturbed by the little "spot of trouble" they're having, they are bantering about extending summer time throughout October for more leisure and insist that theaters and cinemas be reopened. Sir John Squire, and others, complain that B. B. C. has been giving too many dreary bulletins and too little good music, so livelier programs are in preparation. Sir John also has a couple of clevah ideas for war songs, adapted from those of the last war:

Pack up your Goebbels in
your old kit-bag
And Heil! Heil! Heil!

and—

What's the use of Goering?
Ta dah, Dee dah, dah dah.

All together now boys.

Samson Was A Sissy

■ A new sign on the wall of our favorite barber shop reads: *Samson was a piker. He killed only a thousand men with the jawbone of an ass. Every hour in the day* 10,000 *sales are killed with the same weapon!*

Ambushed Reader

■ Just arrived is an airmail special from "clear out in the cacti" of Florence, Arizona from consulting engineer, Percy E. Wright who needed a current issue of STEEL in a rush. He adds: "Old acquaintances in the profession, who knew me years ago, wonder why I am at Florence—a place where some people come for their health, while others are sent here to do time in the State Prison! I am here for *neither reason* but am carrying on an engineering practice from ambush up in the mountains." Hundreds of miles from his own library, and with no library in Florence, Mr. Wright finds STEEL a life-saving contact with industrial civilization.

Why Is A Book Agent?

■ Our circulation representative in the Pittsburgh territory would like to know is he mice or men after his call at Pittsburgh Gage & Supply Co. last week. In the reception room he read: "Insist on an audience in a reasonable length of time, or a reason for the delay. It is the policy of this company to extend courteous treatment to every human being—*even book agents!*"

SHRDLU

boost in c.i.f. prices for Japanese shipments. Japan still is buying steadily. Exports from Portland to Japan to Oct. 1 were 136,222 tons, triple the total a year ago.

Toronto, Ont.—Prices have been advanced 25 cents on No. 1 and No. 2 heavy melting steel and mixed dealers' steel. Other grades are unchanged but strong. Demand is steady and offerings to dealers limited, resulting in little yard accumulation.

Warehouse

Warehouse Prices, Page 187

Cleveland—Minimum base quantity on cold-drawn carbon bars has been raised from 1000 to 1500 pounds. Revisions in quantity extras on cold-drawn alloy bars are in prospect. Base prices are unchanged.

Chicago — Sold-out condition of mills in some products is driving increasing business to warehouses. Distributors' stocks are declining, with supplies of certain sizes of some items depleted.

Boston—Quantity extras on cold-drawn carbon bars have been revised, including the order extra on lots of less than 300 pounds. Demand is steady and well diversified in most districts.

New York—Demand is maintained at the recent brisk rate, alloys being especially active with prices generally firm. Volume with some warehouses the first half of October was 15 to 20 per cent ahead of September.

Philadelphia — Warehouses have advanced reinforcing bars in lots of 1 to 5 tons $5 a ton to 2.76c in line with mill action. Number of orders has increased 12 to 15 per cent over September.

Cincinnati — Demand is heavier, partly through diversion of mill business. Higher prices on galvanized sheets are expected.

St. Louis—Sales are increasing. Warehouses are receiving an increasing number of inquiries from buyers relative to what extent resellers can be depended upon for supplies in coming months.

Los Angeles—Business continues at an encouraging rate with practically every form of steel in demand. Recent price changes include advances of 15 cents in soft bars, bands and floor plates.

Seattle — Business has receded slightly, following heavy buying of bars in anticipation of the recent price advance. Prices on other products are firm but in most cases still are below Portland levels.

Tin Plate

Tin Plate Prices, Page 184

Tin plate production is up 2 more points to 92 per cent, new high for the year. Cold mills are practically at capacity, with hot mills being added as rapidly as possible. No more domestic orders are being taken for delivery this quarter. Export inquiry is heavy and still rising, with prices generally above domestic levels. Higher quotations appear likely on first quarter business.

Steel in Europe

Foreign Steel Prices, Page 187

London — (*By Cable*) — British steel plants are fully active in all departments, with output still expanding. Commercial users are receiving fair deliveries. Coke and ore supplies are plentiful, but available semifinished steel is just sufficient. The British treasury has announced an import duties exemption order which places all forms of pig iron on the free list, effective as of Oct. 10.

Belgium and Luxemburg report improvement in the raw materials situation. Export trade is slightly more active, now being practically uncontrolled.

Iron Ore

Iron Ore Prices, Page 188

Cleveland — Lake Superior iron ore shipments from upper lake ports totaled 7,865,007 gross tons in September, an increase of 13.1 per cent over August and 139.4 per cent larger than a year ago, according to the Lake Superior Iron Ore association. Movement for the season to Oct. 1 was 114.4 per cent larger than in 1938. Comparisons follow:

Port	To Oct. 1 1939	To Oct. 1 1938
Escanaba	1,700,590	750,378
Marquette	2,875,817	775,847
Ashland	3,652,317	1,472,840
Superior	9,729,885	5,174,112
Duluth	6,165,456	3,046,122
Two Harbors	6,236,709	2,937,991
Total	30,360,774	14,157,290

Coke Oven By-Products

Coke By-Product Prices, Page 185

New York—Expected advance in naphthalene prices this month has resulted in heavy buying by jobbers and chemical and other industrial users. Naphthalene advanced 1 cent a pound Oct. 10 to 6.75c to jobbers. Other coke oven by-product prices are unchanged, with demand heavy. Buying has exceeded the gain in production with the result distillates, notably benzol, toluol and xylol, are in short supply. Practically all consuming channels are buying and apparently working off current shipments without adding to stocks. Phenol is also more active, the plastic trade buying briskly.

2500 Girls Employed Inspecting Tin Plate

■ Nearly 2500 sharp-eyed young women selected for their ability to spot flaws that men might miss are employed by the steel industry to inspect tin plate, according to the American Iron and Steel institute.

Searching for defects, they scrutinize both sides of every sheet of tin plate produced. They have been found superior to men for tin plate inspection because the work is not unlike sewing, knitting and other feminine arts that require patience and dexterity with the hands. Nearly two-thirds of the girls are not more than 25 years old.

After five or six months' training, they spot not only defects which may be seen with the eye, such as scratches, pinholes or bare spots in the thin coating of tin which covers the steel sheet, but also those which must be felt, such as sheets that are over or under the desired thickness, or sheets coated with an uneven thickness of tin.

when the average of many welders must be High . . .

Specify PAGE HI-TENSILE "F"

● A rod that fits every welder's style is valuable to you on jobs on which a number of welders are working—but on which results from each must meet the same standards.

In Page Hi-Tensile "F" you have this rod. It is fast—smooth-running. Good for work in tight places. Used equally well on horizontal, vertical and overhead jobs. It's quiet—and has little spatter and slag loss.

Hi-Tensile "F" is especially well adapted to work in CRO-MAN-SIL, COR-TEN, H.T.50 and other new alloy steels.

Your local Page distributor will give you some interesting information on Hi-Tensile "F" and other Page electrodes.

BUY ACCO QUALITY in Page Welding Electrodes, Page Wire Fence, TRU-LAY Preformed Wire Rope, Reading-Pratt & Cady Valves, Campbell Abrasive Cutting Machines, American Chains and Wright Hoists, Cranes and Trolleys.

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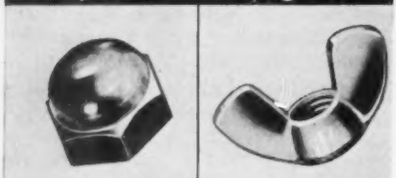

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PRODUCTS of an improved process developed through years of experience in the manufacture of precision screw products, Parker-Kalon *Cold-forged* Socket Screws, Cap Nuts, Wing Nuts and Thumb Screws possess that *strength, uniformity* and *accuracy* that spell Q-U-A-L-I-T-Y. Stocked by reliable industrial distributors near you. Write for free samples . . . compare . . . see for yourself.

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Italian Government Controls Raw Materials

■ Extent of control exercised by the Italian government over the raw materials required by the domestic iron and steel industry is indicated in a report by Consul Lester L. Schnare, Milan, to the commerce department.

The metallic minerals administration, known as AMMI, with headquarters in Rome, while chiefly interested in promoting development of Italy's mineral resources, also controls imports of mineral ores.

The organization for the distribution of scrap, with head offices in Milan, purchases iron and steel scrap abroad. This agency controls only supplies of imported iron and steel scrap used by Italian iron and steel plants, with the exception of pig iron foundries.

Complete Control Established

The National Consortium for Raw Materials for Pig Iron Foundries, having headquarters in Milan, has established complete control over the collection and distribution of all domestic scrap iron, as well as of all imports of pig iron scrap and other raw materials required by Italy's iron foundries. The organization receives applications for materials required by the foundries, transmits them to the general commissariat of war manufactures and eventually allots quotas of the materials desired to the foundries. It places all orders for imports of these materials from abroad and controls all collections of scrap materials within the country.

Together with the three agencies mentioned, the iron and steel industry is subject to indirect control from a number of other official organizations.

As a result of this wide-spread government control, a large part of the trade in raw materials used by the iron and steel industry has been taken entirely out of the hands of private dealers and effected by the several official organizations.

Production of iron and steel in Italy has increased sharply in the last five years. Pig iron output of 1938, totaling 863,000 tons, was 65 per cent greater than the 1934 figure. During the same period production of steel increased 25 per cent to 2,323,000 tons and that of alloy by 26 per cent to 65,800 tons. Iron ore production in 1938 amounted to 1,011,000 tons which was practically double the 1934 total.

During the period between 1934 and 1938, Italian imports of iron ore, manganese ore and scrap iron registered an appreciable decline. Pig iron imports, however, in 1938 were slightly higher than in the earlier year.

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Strong Magnesium Alloy From Magnesite Ore

■ State department of mines and mining, Olympia, Wash., announces an electrochemical process for producing magnesium from magnesite ore has been perfected at Washington State college, Pullman, Wash.

Dean A. E. Drucker states ore can be refined for 6 cents per pound, "producing an alloy as strong as steel and considerably lighter." A pilot plant will be installed at Pullman, in co-operation with the United States bureau of mines, to demonstrate possibilities of commercial production. This development looks to utilization of extensive magnesite deposits in Stevens county, Washington.

Seven Months' Tin Plate Output Up 28 Per Cent

■ World tin consumption for the first seven months this year averaged 12,440 tons monthly, compared with 12,600 tons monthly in 1938. Consumption in the United States increased 19 per cent from 4227 tons monthly in 1938 to 5011 tons monthly in the first seven months this year, according to the International Tin Research and Development council, the Hague, Holland.

World production decreased to an average of 11,000 tons a month in the first seven months, compared with a monthly average of 12,370 tons in 1938. World tin plate production for seven months totaled 2,230,000 tons, against 1,744,000 tons in the corresponding period last year, an increase of 28 per cent.

Product Improvement Is Training Course Aim

■ Product betterment in the malleable iron industry is expected to be one benefit of the recent technical training course sponsored by Malleable Founders' society at Rensselaer Polytechnic institute, Troy, N. Y. Course was eight weeks, open only to employes of the society, and was intended to provide an opportunity for young men to become acquainted with the more technical phases of producing malleable iron.

Dr. M. A. Hunter, head of the Rensselaer department of metallurgy, supervised the course. Scott McKay, professor of metallurgical engineering, Augustus Jones, assistant professor of metallurgical engineering and Dr. Harris M. Sullivan, instructor in metallurgical engineering, had charge of lectures, seminars and laboratory work. Enrique Touceda, the society's consulting engineer, and James H. Lansing, society's shop practice engineer, delivered lectures.

In addition to class and laboratory work, course included visits to Worcester works, American Steel & Wire Co.; Malleable Iron Fittings Co., Brantford, Conn.; Albany Car Wheel Co., Albany, N. Y.; Allegheny Ludlum Steel Corp., Watervliet, N. Y.; General Electric Co., Schenectady, N. Y.

Ferroalloys

Ferroalloy Prices, Page 186

New York—Ferromanganese shipments are heavy, although the movement is expected to be lighter than last month, when there was a rush to get tonnage in before lower priced contracts expired. Prices are unchanged, including tungsten alloys. The latter in turn reflect steadiness in tungsten ores.

Equipment

New York—Requisitions are being compiled by the Delaware, Lackawanna & Western railroad for purchase of 176 machine and shop tools, including about 20 heavy units, for the shops at Buffalo, Scranton and Kingsland. Aircraft engine and equipment buying continues heavy; also government contracts. Crane buying and inquiry is brisk, notably for shipyards.

Boston — Machine builders continue to book domestic orders in good volume while operating near capacity in most instances with substantial backlogs. Deliveries on numerous lines are further extended and more business is being taken at prices subject to adjustment at time of shipment. Aircraft equipment orders are holding and shipyards have also placed considerable machinery in the East, notably the Bethlehem shops. Nearly 75 per cent of current domestic business is due directly or indirectly to government activities. Watertown, Mass. arsenal has bids on 12 horizontal boring mills and two center drive double end boring lathes; Springfield armory on eight vertical drill presses and nine punch presses. Orton Crane & Shovel Co., Chicago, at $263,825 has the contract for four 40-ton and eight 30-ton diesel-driven eight-wheel standard

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gage locomotive cranes for navy yards at Boston, Portsmouth, N. H., and Brooklyn. Awards for Boston also include two horizontal boring, drill and milling machines, William Sellers & Co., Philadelphia, $77,468, and one to Henry Prentiss & Co., New York, $22,259.50, bids Sept. 27.

Seattle — Price advances have stimulated turnover in machinery and equipment, sales being better than normal. General Electric Co. is low to United States engineer, Bonneville dam, at $1,409,734 for two generators and auxiliaries. Bids close at Olympia Oct. 17 for coal and ash conveying equipment for a state institution.

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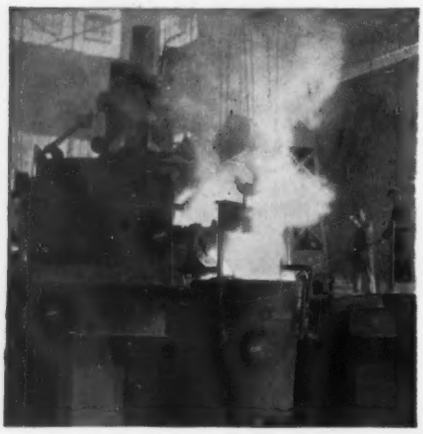

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Die Blocks & Piston Rods

NATIONAL FORGE AND ORDNANCE COMPANY

IRVINE, WARREN COUNTY, PENNA.

Nonferrous Metals

New York—Developments in nonferrous metal markets last week were marked by a gradual increase in offerings at steady to firm price levels. Fear of shortages which prompted heavy coverage last month has been dispelled and most consumers now find themselves in a well-protected position, at least through the balance of this year. Shipments have increased in line with the heavier commitments and are being taken out generally as originally scheduled. This reflects in part the active rate of special consumption with operations at capacity in copper and brass mills; at 92 per cent, a two year high in tin plate mills; at 78 per cent for galvanized sheet mills.

Copper—Undertone of the market did not appear quite so strong since consumers were able to obtain desired tonnages directly from producers at 12.50c, Connecticut. Casting copper was offered during the week at 12.12½c, f.o.b. refinery but closed each day at the unchanged 12.25-cent level. Sales for the week dropped to around 5000 tons, the smallest turnover since the outbreak of hostilities abroad. Activity in the export market was quiet with prices holding nominally at 12.50c, f.a.s.

Lead—Demand tapered but the turnover exceeded expectations with substantial tonnages bought for delivery this month. Prices held at 5.35c, East St. Louis.

Zinc—Sellers were more disposed to sell at the open market this week in contrast to the recent policy of accepting most business only on an average price basis or at the price on date of shipment. Prime western continued firm at 6.50c, East St. Louis.

Tin—The market was quoted only on a nominal basis since prices varied widely from sale to sale. Straits spot was quoted around 55.00c while futures fluctuated from 46.75c to 48.00c.

Antimony—Buyers showed only routine interest throughout the week and prices held nominally unchanged at 14.00c, New York, for American spot in cases and nominally 14.00c, duty paid New York, for Chinese spot.

Nonferrous Metal Prices

	Copper			Straits Tin, New York							
Oct.	Electro, del. Conn.	Lake, del. Midwest	Casting, refinery	*Spot	*Futures	Lead N. Y.	Lead East St. L.	Zinc St. L.	Aluminum 99%	Antimony Amer. Spot, N.Y.	Nickel Cathodes
7	12.50	12.50	12.25	56.00	47.00	5.50	5.35	6.50	20.00	14.00	35.00
9	12.50	12.50	12.25	55.00	48.00	5.50	5.35	6.50	20.00	14.00	35.00
10	12.50	12.50	12.25	55.00	46.75	5.50	5.35	6.50	20.00	14.00	35.00
11	12.50	12.50	12.25	55.00	47.25	5.50	5.35	6.50	20.00	14.00	35.00
12—Holiday											
13	12.50	12.50	12.25	55.00	47.00	5.50	5.35	6.50	20.00	14.00	35.00

*Prices quoted are nominal.

MILL PRODUCTS

F.o.b. mill base, cents per lb., except as specified. Copper brass products based on 12.50c Conn. copper

Sheets

Yellow brass (high)	19.06
Copper, hot rolled	20.87
Lead, cut to jobbers	8.30
Zinc, 100 lb. base	11.25

Tubes

High yellow brass	21.81
Seamless copper	21.37

Rods

High yellow brass	14.76
Copper, hot rolled	17.37

Anodes

Copper, untrimmed	18.12

Wire

Yellow brass (high)	19.31

OLD METALS

Nom. Dealers' Buying Prices

No. 1 Composition Red Brass

New York	8.37½-8.50
Cleveland	9.37½-9.62½
Chicago	8.75-9.00
St. Louis	8.50-8.75

Heavy Copper and Wire

New York, No. 1	10.00-10.25
Cleveland, No. 1	9.87½-10.12½
Chicago, No. 1	10.00-10.25
St. Louis	9.75-10.00

Composition Brass Turnings

New York	8.00-8.25

Light Copper

New York	8.00-8.25
Cleveland	8.12½-8.37½
Chicago	7.87½-8.12½
St. Louis	7.75-8.00

Light Brass

Cleveland	4.62½-5.12½
Chicago	5.62½-5.87½
St. Louis	5.00-5.50

Lead

New York	4.85
Cleveland	4.62½-4.75
Chicago	4.25-4.50
St. Louis	4.00-4.25

Zinc

New York	3.50-3.75
Cleveland	3.50-3.75
St. Louis	3.75-4.00

Aluminum

Mixed, cast, Cleveland	10.25-10.50
Borings, Cleveland	7.75-8.00
Clips, soft, Cleveland	15.75-16.00
Misc. cast, St. Louis	8.25-8.50

SECONDARY METALS

Brass ingot, 85-5-5-5, less carloads	13.75
Standard No. 12 aluminum	14.00-15.00

Construction and Enterprise

Ohio

DAYTON, O. — Contracting officer, Wright Field, is taking bids to 10 a.m., Oct. 20, on 46 air compressors of miscellaneous types, all motor driven.

DAYTON, O. — Contracting officer, Wright Field, is taking bids to 10 a.m., Oct. 23, on 1612 vises of miscellaneous types and sizes.

DAYTON, O. — Contracting officer, Wright Field, is taking bids to 10 a.m., Oct. 24, on one head type, rotary die bolt machine; one set chasers, bolt, national coarse, thread, high speed, steel in various sizes; 32 portable electric sanders.

LAKEMORE, O.—Village, Ruth Young Kocher, clerk, will vote Nov. 7 on special bond issue of $25,000 to help finance construction of sewage disposal plant; to cost $162,000. WPA application already filed. Paul W. Elwell, 5005 Euclid avenue, Cleveland, consulting engineer.

NORTH BALTIMORE, O. — Village, Fred Halboth, mayor, plans construction of municipal light and power system with WPA aid. Includes two 450 horsepower and one 375 horsepower diesel engines. J. C. Simon, Van Wert, O., engineer. (Noted Aug. 7).

ST. MARY'S, O.—City, W. R. Cook, service director, is taking bids to noon, Oct. 20, on construction of power transmission line to cost $21,000.

Vermont

BARRE, VT.—J. A. Gordon, attorney for rural electric co-operative being formed, has $68,000 REA fund for construction of 53 miles rural transmission line in Washington county.

Indiana

ELKHART, IND.—Dobbins Mfg. Co., St. Paul, will establish branch plant here soon; to manufacture sprayers, dusters, planters, various metal specialties for farm trade.

Massachusetts

GREENFIELD, MASS.—Greenfield Tap & Die Corp. plans to construct addition to plant. Project at present in abeyance. McClintock & Craig, 458 Bridge street, Springfield, Mass., engineers.

Pennsylvania

MEADVILLE, PA.—City, G. Stanley Maxwell, clerk, plans to replace incinerator with modern structure and equipment, to cost $65,000. Roy L. Phillips, city hall, engineer.

Michigan

ADRIAN, MICH.—J. F. Ervin Foundry & Mfg. Co. plans to rebuild plant damaged by fire with loss of about $15,000.

HART, MICH. — Oceana electric co-operative, Loyal Churchill, superintendent, has $112,000 REA fund for construction of 91 miles rural transmission line in Oceana, Mason, Newaygo counties.

KALAMAZOO, MICH.—Brundage Co., Homer F. Brundage, president, manufacturer of ventilating apparatus, has purchased Clark Engine & Boiler Co. plant; will improve structure, install new equipment.

Alabama

ANDALUSIA, ALA.—Montezuma Hotel Co. has plans ready for bids on proposed $200,000 hotel, air conditioned, steam heated.

ANNISTON, ALA.—Monsanto Chemical Co., Edgar M. Queeny, St. Louis, president, has board of directors' approval for construction of additional diphenyl manufacture unit; work to start soon.

MOBILE, ALA.—Alabama public service commission, Montgomery, has granted Alabama Power Co., Birmingham, certificate of convenience and necessity to construct steam generating plant at Chickasaw, Mobile suburb, for power production to serve Mobile; first unit estimated to cost $4,000,000; construction expected to start soon.

Maryland

BALTIMORE—I. Sekine Co. Inc. plans construction of 28 x 152-foot factory, 1-story.

HYATTSVILLE, MD.—Washington suburban sanitary commission opens bids Oct. 27 for Anacostia river sewage treatment works; to cost about $700,000. Whitman, Requardt & Smith, West Biddle and Charles streets, Baltimore, engineers.

SALISBURY, MD.—Eastern Shore public Service Co. of Maryland, Delmarva Power Co. and Maryland Light & Power Co., all owned by Eastern Shore Public Service Co. of Delaware, Salisbury, Md., and 57 Williams street, New York, plan merging into one utility company to serve communities in every county of Eastern Shore; have applied for refinancing permits to public service commission, Baltimore, would issue $8,000,000 bonds, $600,000 for expansion and remodeling generating plant at Vienna, installation of

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District of Columbia

WASHINGTON — Bureau of supplies and accounts, navy department, receives bids until 10 a.m., Oct. 20, on the following: three motor driven universal horizontal milling machines; one vertical hydraulic motor driven broaching machine; one sheet metal forming and flanging motor driven machine; two plain knee type motor driven milling machines; one unit of angle bending, motor driven rolls; one high speed, motor driven router machine; two tool room, electrically driven precision lathes; one motor driven toolmakers' precision lathe.

Bids on the following due 10 a.m., Oct. 24: two motor driven turret lathes; one heavy duty motor driven inclinable press; one tool room type, motor driven precision lathe; one universal, motor driven machine shaper; two geared head, motor driven engine lathes; two motor driven geared head, toolmakers' precision lathes; two all-geared motor driven drilling and tapping machines; one vertical, motor driven milling machine; one foot operated squaring shear; one motor driven press brake machine; one load indicator; one motor driven shearing machine; one motor driven, press type forming brake; and one motor driven, geared head, heavy duty engine lathe.

Florida

FT. LAUDERDALE, FLA. — Florida Power & Light Co., Ft. Lauderdale, plans construction of plant additions, installation of 25,000 kilowatt oil-burning steam generating plant. $1,000,000 appropriated; private plans.

PLANT CITY, FLA.—Plant City state farmers' market, James McGee, manager, plans addition of ice plant and cold storage facilities; cost $20,000.

VALPARAISO, FLA.—Valparaiso Hosiery Mill plans rebuilding burned plant.

Georgia

ATLANTA, GA.—Hugh I. Richardson, 160 Peachtree, N. W., plans construction of manufacturing building to cost $35,000.

CAMILLA, GA.—Mitchell County Electric Membership Corp., Nathan M. Keadle, superintendent, has $264,000 REA allotment for construction of 322 miles rural transmission line in 11 counties.

DUDLEY, GA.—Oconee Electric Membership Corp., J. L. Allen, president, opens bids Oct. 12 for construction of 226 miles primary and secondary rural transmission line in four counties. J. B. McCrary Engineering Corp., Marietta building, Atlanta, Ga., engineer.

LOUISVILLE, GA. — Jefferson County Electric Membership Corp., James P. Polhill Jr., superintendent, has $306,000 REA grant for construction of 385 miles rural transmission line in 11 counties.

MOULTRIE, GA.—Colquitt County Rural Electric Co., O. O. Owens, superintendent, has $362,000 REA fund for construction of 487 miles rural transmission line in nine counties.

Mississippi

WEST POINT, MISS. — Four-county electric power association has REA loan of $232,000 for construction of 200 miles rural transmission line in four counties, office building and cold storage plant.

YAZOO CITY, MISS.—Yazoo Refinery Co., W. C. Cruger, Ft. Worth, Tex., representative, plans to construct refinery in recently established section known as Tinsley.

North Carolina

CHARLOTTE, N. C.—Brown Equipment Co., 829 South Summit street, plans erection of $40,000 addition.

CHARLOTTE, N. C. — C. O. Kuester, manager, chamber of commerce, is interested in establishment of livestock packing plant; investment of $100,000.

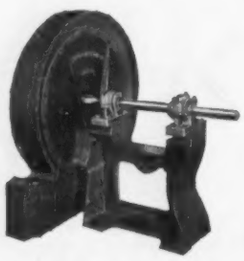
GASTONIA, N. C.—Parkdale Mills Inc., South Yates street, has plans in progress for addition to mill.

MOCKSVILLE, N. C.—Davie Electric Membership Corp. has been granted REA allotment of $125,000 to build 129 additional miles rural transmission line in Iredell, Yadkin, Alexander counties.

RICHLANDS, N. C.—Jones-Onslow Electric Membership Corp., E. B. Smith, president, has been granted $284,000 REA fund for construction of 277 miles rural transmission line in Onslow, Jones, Duplin, Lenoir counties.

SCOTLAND NECK, N. C.—Halifax Electric Membership Corp. has secured $107,000 REA fund for construction of 108 miles rural transmission line in Warren county.

SHALLOTTE, N. C.—Brunswick Electric Membership Corp. has been granted $95,000 REA allotment for construction



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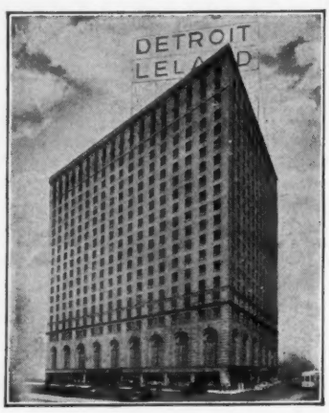

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GARAGE IN CONNECTION

of 113 miles rural transmission line in Columbus and Bladen counties.

South Carolina

BAMBERG, S. C.—Edisto Electric Co-operative Inc., H. E. Jennings, president, has $49,000 REA fund for construction of 66 miles rural transmission line in Dorchester county.

BAMBERG, S. C.—Edisto Electric Co-operative Inc., H. E. Jennings, president, opens bids Oct. 19 for construction of 270 miles primary and secondary rural transmission lines in four counties. J. B. McCrary Engineering Corp., Marietta building, Atlanta, Ga., engineer.

Louisiana

BATON ROUGE, LA.—Standard Oil Co. of Louisiana has plans underway for installation of new equipment to cost about $3,000,000.

Virginia

BOWLING GREEN, VA.—Virginia electric co-operative has secured $79,000 REA grant for construction of rural transmission line.

FRONT ROYAL, VA.—American Viscose Corp. plans to install new unit in Front Royal plant for additional rayon staple fiber production. New unit to have annual capacity of 25,000,000 pounds, be ready for operation by next summer.

MILLBORO, VA.—B. A. R. C. electric co-operative has been granted $89,000 REA allotment for construction of rural transmission line.

PRINCE GEORGE, VA.—Prince George electric co-operative has secured $135,000 REA fund for construction of 141 miles rural transmission line in Prince George, Surrey, Sussex counties.

RICHMOND, VA.—City, G. M. Bowers, public works director, opens bids Oct. 18 for construction and erection of 10-ton revolving electric crane mounted on full portal traveling gantry at Richmond municipal terminal; to cost about $35,000.

Missouri

JEFFERSON CITY, MO.—State building commission. Edgar M. Eagan, executive secretary, Merchants Bank building, is taking bids to Oct. 20, 10 a.m., on construction of 300 horsepower diesel engine generating plant and distributing system at auxiliary prison, to cost about $50,000. Baumes Engineering Co., Railway Exchange building, St. Louis, consulting engineer. (Noted Aug. 14.)

KANSAS CITY, MO.—Borden Co., Holmes street, plans construction of ice cream manufacturing unit. A. W. Archer, Pioneer Trust building, architect.

LINN, MO.—Three Rivers Electrical Corp. has been allotted $249,000 REA grant for construction of rural transmission line.

MARYVILLE, MO. — Nodaway-Worth county rural electric co-operative, Gerald Noedeker, co-ordinator, is preparing preliminary plans for construction of rural transmission line. Burns & McDonnell Engineering Co., 107 West Linwood boulevard, Kansas City, Mo., consulting engineers.

MOUNT VERNON, MO.—Ozark electric co-operative has been granted $59,000 REA loan for construction of 58 miles rural transmission line in Christian, Polk, Greene counties. W. L. Boucher is superintendent; Sverdrup & Parcel, Railway Exchange building, St. Louis, consulting engineers.

SPRINGFIELD, MO.—Jackson county public water system, district number five, has voted $103,000 bonds for construction of complete water system.

SPRINGFIELD, MO.—REA has allotted $319,000 to co-operative now being formed to finance construction of 311 miles rural transmission line in six counties. C. C. Keller, 870 Bonnville, Springfield, is interested in the organization.

Arkansas

PINE BLUFF, ARK.—J. P. McNulty, president, Southeast Arkansas Freight Lines, has acquired site for erection of freight terminal to cost $30,000.

Oklahoma

JAY, OKLA.—Delaware County Water & Light Co. has been incorporated with capital of $100,000. R. Glen Walter and Betty C. Walter incorporators.

TULSA, OKLA.—Grand river dam authority, Vinita, Okla., R. V. L. Wright, manager, has plans maturing for new transmission line from hydroelectric generating station near Pensacola, Okla., now in course of construction, to Tulsa and vicinity, over 60 miles, including two large substations. Cost estimated over $600,000. Holway & Neuffer, 307 East Eighteenth street, Tulsa, consulting engineers.

Wisconsin

GREEN BAY, WIS.—Cleveland-Cliffs Iron Co. has awarded contract for construction of 1-story, 60 x 180 feet, factory to F. J. De Coster & Son.

OCONTO, WIS.—Bond Pickle Co. has awarded contract to E. H. Regal Construction Co., Green Bay, Wis., for erection of 1-story factory addition, 150 x 150 feet.

Minnesota

ST. PAUL—American Can Co. has awarded contract for extensive factory alterations and improvements to William Murphy & Son, New York building.

Texas

CROCKETT, TEX.—Houston County Electric Co-operative Inc., has been incorporated by Jess S. Eaves and Frank L. Hill, 607 Zoe street.

CUERO, TEX.—Dewitt county rural electric co-operative has been granted REA loan of $54,000 for construction of rural transmission line.

LUBBOCK, TEX.—City, W. H. Rodgers, manager, has plans in progress for construction of sewage disposal plant. M. R. Smith Jr., city engineer.

ROBSTOWN, TEX.—City, W. B. Messer, secretary, receives bids Oct. 19 for addition to power plant including natural gas diesel engine generating set of not less than 700 horsepower with three phase generator, additional equipment. Garrett Engineering Co., 918 Richmond avenue, Houston, Tex., engineer. (Noted Sept. 25.)

Nebraska

EMERSON, NEBR.—State railway commission has granted Northeast Nebraska public power district authority to construct 291 miles rural transmission line in Dixon, Dakota, Thurston counties. H. H. Henningson, 1904 Farnam street, Omaha, consulting engineer.

Iowa

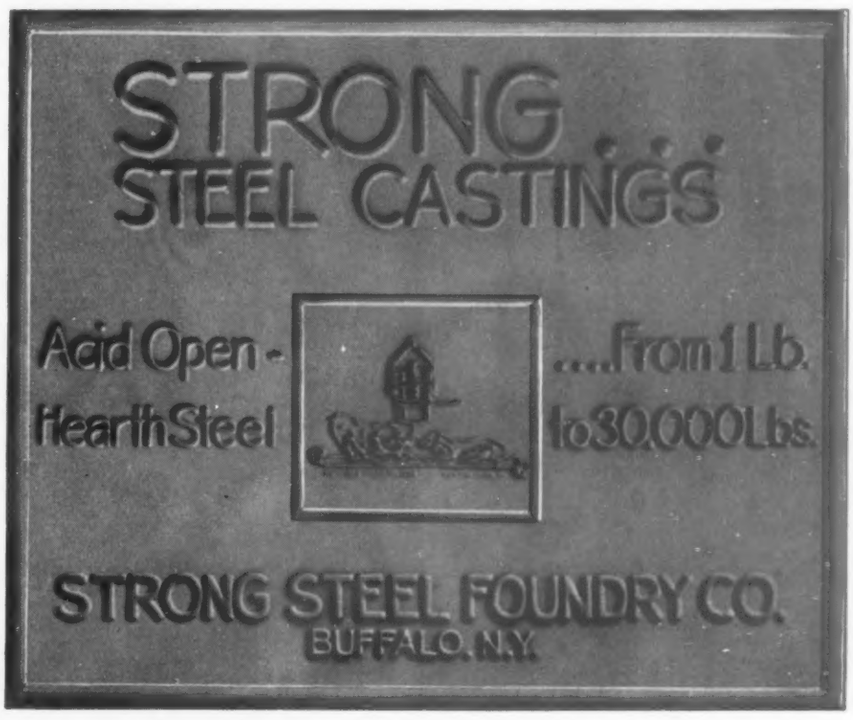
SAC CITY, IOWA—City, Lynn A. Roosa, clerk, has approved, at special election, the construction of a municipal gas plant, to cost $60,000.

Pacific Coast

BEVERLY HILLS, CALIF.—Criterion Machine Works is preparing plans for construction of 68 x 75 foot building.

LOS ANGELES—R. E. Spaulding is constructing machine shop at 3524 Union Pacific avenue, 38 x 49 feet.

SAN PEDRO, CALIF.—Los Angeles Shipbuilding & Dry Dock Co. is preparing plans for construction of ship launching ways and crane structure; entire project to cost $225,000.



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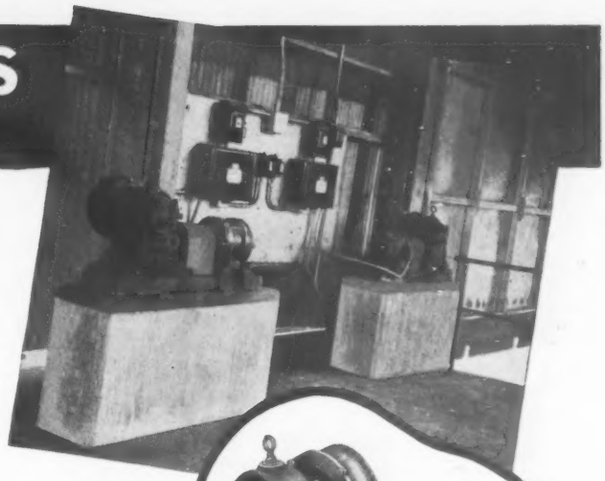
for handling furnace doors



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With the Jones door hoist there is not the slightest hazard created by the possibility of over-travel. When the door is opened, if the motor is not stopped, a bronze ring on the winding drum slips and no damage can result . . . When the door is closed, the bronze ring again slips until the motor is stopped.

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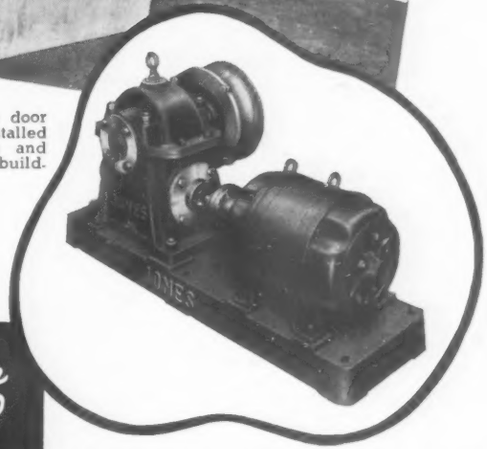
Two Jones door hoists as installed for opening and closing mill building doors



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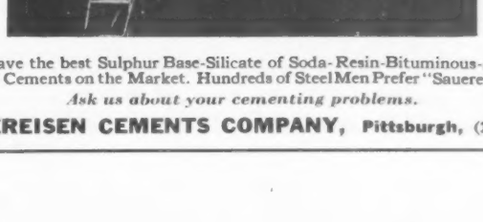

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Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

BOLTS (Stove)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.

BOLTS (Stove, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

BOLTS (Track)—See TRACK BOLTS

BORING MACHINES (Precision)
Heald Machine Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.

BOXES (Annealing)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
National-Erie Corp., Erie, Pa.
Union Steel Casting Co., 62nd & Butler Sts., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BOXES (Open Hearth Charging)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

BRAKE LININGS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Electric)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

BRAKES (Hydraulic)
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

BRAKES (Press)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

BRAZING EQUIPMENT
American Gas Furnace Co., Elizabeth, N. J.

BRICK—(Insulating)—See INSULATING BRICK

BRICK (Refractory)—See REFRACTORIES, CEMENT, ETC.

BRICK (Acid Resisting)
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

BRICK (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

BRIDGE CRANES (Ore and Coal Handling)—See CRANES (Bridge)

BRIDGES, BUILDINGS, VIADUCTS, STACKS, ETC.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Blaw-Knox Co., Blawnox, Pa.
Columbia Steel Co., San Francisco, Calif.

BROACHING MACHINES
Bullard Co., The, Bridgeport, Conn.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Colonial Broach Co., 147 Jos. Campau, Detroit, Mich.

BRUSHES (Industrial)
Pittsburgh Plate Glass Co., Brush Div., Baltimore, Md.

BUCKETS (Clam Shell, Dragline Grab, Single Line)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Blaw-Knox Co., Blawnox, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.

BUCKETS (Single Hook, Automatic Dump, Automatic Single Line)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

BUILDINGS (Steel)—See BRIDGES, BUILDINGS, ETC.

BULLDOZERS
Beatty Machine & Mfg. Co., Hammond, Ind.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

BURNERS (Acetylene)—See TORCHES AND BURNERS

BURNERS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BURNERS (Fuel, Oil, Gas, Combination)
American Gas Furnace Co., Elizabeth, N. J.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

BUSHINGS (Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Johnson Bronze Co., 550 So. Mill St., New Castle, Pa.
Shenango-Penn Mold Co., Dover, O.

BY-PRODUCT PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

CAISSONS (Pneumatic)
Dravo Corp., (Contracting Div.), Neville Island, Pittsburgh, Pa.

CALCIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CAP SCREWS—See SCREWS (Cap, Set, Safety-Set)

CAR DUMPERS
Alliance Machine Co., The, Alliance, O.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CAR PULLERS and SPOTTERS
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Link-Belt Co., 2410 W. 18th St., Chicago, Ill.

CARBIDE
Linde Air Products Co., The 30 E. 42nd St., New York City.
National Carbide Corp., 60 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

CARBURIZERS
Houghton, E. F. & Co., 240 W. Somerset St., Philadelphia, Pa.

CARS (Charging)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Morgan Engineering Co., The, Alliance, O.

CARS (Industrial and Mining)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

CARS (Scale)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

CASTINGS (Acid Resisting)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Meehanite Metal Corp., Pittsburgh, Pa.
National Alloy Steel Co., Blawnox, Pa.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.

CASTINGS (Alloy Steel)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell St., Chicago, Ill.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Brass, Bronze, Copper, Aluminum)
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.
Shenango-Penn Mold Co., Dover, O.
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Brass, Pressure)
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS (Die)—See DIE CASTINGS

CASTINGS (Electric Steel)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National-Erie Corp., Erie, Pa.
Reading Steel Casting Div. of American Chain & Cable Co. Inc., Reading, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

CASTINGS (Gray Iron, Alloy, or Semi-Steel)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Columbia Steel Co., San Francisco, Calif.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Oil Well Supply Co., Dallas, Texas.
Shenango Penn Mold Co., Dover, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

CASTINGS (Heat Resisting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
National Alloy Steel Co., Blawnox, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Malleable)
American Chain & Cable Co. Inc., Bridgeport, Conn.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Erie Malleable Iron Co., W. 12th & Cherry Sts., Erie, Pa.
Jamestown Malleable Iron Corp., 500-700 Tiffany Ave., Jamestown, N. Y.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Peoria Malleable Castings Co., Peoria, Ill.

CASTINGS (Manganese Steel)
Damascus Steel Casting Co., New Brighton, Pa.

CASTINGS (Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Damascus Steel Casting Co., New Brighton, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Koppers Co., Western Gas Div., Fort Wayne, Ind.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Oil Well Supply Co., Dallas, Texas.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Steel Founders' Society of America, 920 Midland Bldg., Cleveland, O.
Strong Steel Fdy. Co., Hertel & Norris Ave., Buffalo, N. Y.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Steel Casting Co., 62nd and Butler Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
West Steel Casting Co., 805 E. 70th St., Cleveland, O.

CASTINGS (Wear Resisting)
Meehanite Metal Corp., Pittsburgh, Pa.
Shenango Penn Mold Co., Dover, O.

CASTINGS (Worm and Gear Bronze)
Cadman, A. W., Mfg. Co., 28th and Smallman Sts., Pittsburgh, Pa.

CEMENT (Acid Proof)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sauereisen Cements Co., Sharpsburg Sta., Pittsburgh, Pa.

CEMENT (High Temperature)
Carborundum Co., The, Perth Amboy, N. J.
Norton Company, Worcester, Mass.

CEMENT (Refractory, High Temperature)
Johns-Manville Corp., 22 E. 40th St., New York City.

CENTRAL STATION EQUIPMENT
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CHAIN (Draw Bench)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

CHAIN (Malleable)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Lake City Malleable Co., 5026 Lakeside Ave., Cleveland, O.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

CHAIN (Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

CHAIN (Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.

CHAINS (Sling)
American Chain & Cable Co. Inc., Bridgeport, Conn.

CHAIN (Sprocket)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Peoria Malleable Castings Co., Peoria, Ill.

CHAIN (Steel-Finished Roller)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

CHAIN (Welded or Weldless)
American Chain & Cable Co., Bridgeport, Conn.

CHARGING MACHINES (Cupola)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES (Open Hearth)
Morgan Engineering Co., The, Alliance, O.

CHARGING MACHINES AND MANIPULATORS (Autofloor Type)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

CHECKER BRICK
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.

CHROME ORE
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

CHROMIUM METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

CHUCKING MACHINES (Multiple Spindle)
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

CHUCKS (Automatic Closing)
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CLEANING SPECIALTIES
American Chemical Paint Co., Ambler, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

CLUTCHES (Friction)
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Twin Disc Clutch Co., 1328 Racine Ave., Racine, Wis.

CLUTCHES (Friction, Overrunning Single Revolution)
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.

COAL OR COKE
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Koppers Co., The, Gas & Coke Div., Pittsburgh, Pa.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Koppers Coal Co., Koppers Bldg., Pittsburgh, Pa.
New England Coal & Coke Co., Boston, Mass.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

COAL, COKE, ORE AND ASH HANDLING MACHINERY
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Koppers-Rheolaveur Co., Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill .

COILS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

COKE—See COAL OR COKE

COKE OVEN MACHINERY
Alliance Machine Co., The, Alliance, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE OVENS (By-Product)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COKE SCREENING PLANTS
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

COMBUSTION BULBS
Norton Company, Worcester, Mass.

COMBUSTION CONTROLS
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.
Morgan Construction Co., Worcester, Mass.
Norton Company, Worcester, Mass.

COMPARATORS (Optical)
Jones & Lamson Machine Co., Springfield, Vt.

COMPENSATORS (Automatic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

COMPOUNDS (Joint)
Sauereisen Cements Co., Sharpsburg Sta., Pittsburgh, Pa.

COMPRESSORS (Air)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Gas Furnace Co., Elizabeth, N. J.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Compressor Corp., Harrison, N. J.

CONCRETE REINFORCING BARS —See BARS (Concrete Reinforcing)

CONDENSERS (Surface, Barometric, Multi-Jet)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Ingersoll-Rand Co., 11 Broadway, New York City.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS (Electric)
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

CONDUITS (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

CONNECTING RODS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466 Pittsburgh, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CONTRACTORS—See ENGINEERS AND CONTRACTORS

CONTROL SYSTEMS (Automatic)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONTROLLERS (Combustion)—See COMBUSTION CONTROLS

CONTROLLERS (Electric)
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

CONTROLS (Oven)
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

CONTROLS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

CONVEYOR BELTS (High and Low Temperature)
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYOR BELTS (Wire)
Cyclone Fence Co., Waukegan, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

CONVEYORS (Apron)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Chain)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Elevating)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

CONVEYORS (Overhead Trolley)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

CONVEYORS (Roller—Power and Gravity)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Mathews Conveyer Co., 142 Tenth St., Ellwood City, Pa.

COPPER (Phosphorized)
National Bearing Metals Corp., 928 Shore Ave., Pittsburgh, Pa.

COPPERING COMPOUND
American Chemical Paint Co., Ambler, Pa.

COTTER PINS
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

COUPLERS (Hose, Instantaneous—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLERS (Valving, Safety—Air and Water)
Hunt, C. B., & Son, Salem, O.

COUPLINGS (Flexible)
Ajax Flexible Coupling Co., Westfield, N. Y.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Hilliard Corp., The, 100 W. 4th St., Elmira, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Poole Fdy. & Mach. Co., Woodberry St., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS (Pipe)
Bethlehem Steel Co., Bethlehem, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas
Republic Steel Corp., Dept ST, Cleveland, O.
Youngstown Sheet & Tube Co., Youngstown, O.

CRANES, BRIDGE (Ore and Coal Handling)
Alliance Machine Co., The, Alliance, O.
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.
Industrial Brownhoist Corp., Bay City, Mich.

CRANES (Charging)
Alliance Machine Co., The, Alliance, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Creeper, Erection)
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Electric)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Gantry)
Alliance Machine Co., The, Alliance, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Ohio Locomotive Crane Co., Bucyrus, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES (Gasoline and Diesel)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Hand)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa

CRANES (Jib)
Alliance Machine Co., The, Alliance, O.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

CRANES (Locomotive)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., Bucyrus, O.

CRANES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Shepard Niles Crane & Hoist Corp. Montour Falls, N. Y.

CRANES (Traveling)
Wright Mfg. Div. of American Chain & Cable Co., Inc., York, Pa.

CRANK SHAFTS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Union Drawn Steel Co., Massillon. O.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

CRUSHERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CRUSHERS (Ring)
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

CUSHIONS (Pneumatic)
Cleveland Punch & Shear Works. 3917 St. Clair Ave., Cleveland. O.

CUTTERS (Die Sinking & End Milling)
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CUTTERS (Gang Slitter)
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

CUTTING AND WELDING—See WELDING

CUTTING OILS—See OILS (Cutting)

CYLINDERS (Air or Hydraulic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pressed Steel Tank Co. Milwaukee, Wis.

DEGREASERS
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., New York City.

DIE BLOCKS
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.

DIE CASTINGS
Titan Metal Mfg. Co., Bellefonte, Pa.

WHERE-TO-BUY

DIE HEADS
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

DIE-SINKING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

DIES (Cast)
Advance Foundry Co., The, 100 Parnell Ave., Dayton, O.
Farrel-Birmingham Co., Inc., 110 Maine St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

DIES (Punching, Stamping, Blanking)
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.

DOORS & SHUTTERS (Steel, Fire, and Rolling)
Kinnear Mfg. Co., 818 Field Ave., Columbus, O.

DOORS FOR COKE OVENS (Automatic Self Sealing)
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

DRAFT GAGES (Indicating, Recording)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

DRILL RODS—See RODS (Drill)

DRILLING MACHINES (Multiple, Heavy Duty)
Baker Bros. Co., Post & Westlake Sts., Toledo, O.
Moline Tool Co., Moline, Ill.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLING MACHINES (Radial)
Cincinnati Bickford Tool Co., Oakley Sta., Cincinnati, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Thomas Machine Mfg. Co., Pittsburgh, Pa.

DRILLS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

DRILLS (Twist)—See TWIST DRILLS

DRIVES (Chain)
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

DRIVES (Cut Herringbone Gear)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

DRIVES (Multi-V-Belt)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DRIVES (Reciprocating)
Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Steel)
Pressed Steel Tank Co., Milwaukee, Wis.

DRYERS (Compressed Air)
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.

DUST ARRESTING EQUIPMENT
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Ruemelin Mfg. Co., 3860 N. Palmer St., Milwaukee, Wis.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

ECONOMIC SERVICE
Brookmire Corp., 551 Fifth Ave., New York City.

ECONOMIZERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

ELECTRIC WELDING—See WELDING

ELECTRIC WIRING—See WIRE AND CABLE

ELECTRICAL EQUIPMENT
Allen-Bradley Co., 1326 So. Second St., Milwaukee, Wis.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.

ELEVATING AND CONVEYING MACHINERY—See CONVEYORS

ENGINEERS AND CONTRACTORS
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Morgan Engineering Co., The, Alliance, O.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

ENGINEERS (Consulting)
Aetna-Standard Engineering Co., The, Youngstown, O.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Hunt, C. H., 1213 First National Bank Bldg., Pittsburgh, Pa.
Lindemuth, Lewis, B., 134 E. 47th St., New York City.
Loftus Engineering Corp., 509 Oliver Bldg., Pittsburgh, Pa.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.
Wean Engineering Co., Warren, O.

ENGINEERS, CONSULTING (By-Products Coke Oven & Gas Plants)
Koppers Co. Engineering and Construction Div., Pittsburgh, Pa.

ENGINES (Gas, Oil)
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES (Steam)
Oil Well Supply Co., Dallas, Texas.

FACING MACHINES (Structural)
Thomas Machine Mfg. Co., Pittsburgh, Pa.

FANS (Crane Cab)
Truflo Fan Co., Harmony, Pa.

FANS (Exhaust, Ventilating)
Sturtevant, B. F., Co. Hyde Park, Boston, Mass.
Truflo Fan Co., Harmony, Pa.

FANS (High Temperature)
Garden City Fan Co., McCormick Bldg., Chicago, Ill.

FANS (Portable)
Perkins, B. F., & Son, Inc., Holyoke, Mass.
Truflo Fan Co., Harmony, Pa.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

FANS (Wall)
Truflo Fan Co., Harmony, Pa.

FENCE (Chain Link)
Page Steel & Wire Div. of American Chain & Cable Co. Inc., Monessen, Pa.

FENCING (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Cyclone Fence Co., Waukegan, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

FERROALLOY (Briquets)
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

FERROALLOYS
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Electro-Metallurgical Sales Corp., 30 E. 42nd St., New York City.
International Nickel Co., Inc., The, 67 Wall St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROMANGANESE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROPHOSPHORUS
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FERROSILICON
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROSILICON (Aluminum)
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROTITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FERROVANADIUM
Electro Metallurgical Sales Corp. 30 E. 42nd St., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

FILES AND RASPS
Simonds Saw & Steel Co., Fitchburg, Mass.

FILLER (Iron)
Sauereisen Cements Co., Sharpsburg Sta., Pittsburgh, Pa.

FILTER CLOTH (Asbestos)
Johns-Manville Corp., 22 E. 40th St., New York City.

FIRE DOORS & SHUTTERS—See DOORS & SHUTTERS

FIRE EXTINGUISHERS
Kidde, Walter, & Co., 140 Cedar St., New York City.

FIRESTONE (Silica)
National Stone Co., Ellwood City, Pa.

FITTINGS (Electric Steel)
Reading-Pratt & Cady Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.

FLAME HARDENING
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., 30 E. 42nd St., New York City.
National-Erie Corp., Erie, Pa.

FLANGES (Forged Steel)
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.

FLANGES (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

FLOORING (Monolithic)
Johns-Manville Corp., 22 E. 40th St., New York City.

FLOORING (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Blaw-Knox Co., Blawnox, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc. 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

FLUE DUST CONDITIONERS
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

FLUE GAS ANALYZERS
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

FLUORSPAR
Hillside Fluor Spar Mines, 38 So. Dearborn St., Chicago, Ill.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

FLUXES (Soldering, Welding & Tinning)
American Chemical Paint Co., Ambler, Pa.

FORGING BILLETS—See BILLETS

FORGING MACHINERY
Alliance Machine Co., The, Alliance, O.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

FORGINGS (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

FORGINGS (Drop) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
*Bethlehem Steel Co., Bethlehem, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.

FORGINGS (Hollow Bored)
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

FORGINGS (Iron and Steel) (*Also Stainless)
*Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., W. 19th and Cranbery Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
*Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Oil Well Supply Co., Dallas, Texas.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

FORGINGS (Upset)
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem Steel Co., Bethlehem, Pa.

FROGS AND SWITCHES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.

FURNACE INSULATION—See INSULATION

FURNACES (Blast)
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
McKee, Arthur G., & Co., 2422 Euclid Ave., Cleveland, O.

FURNACES (Brazing)
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Electric Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.

FURNACES (Electric Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
General Electric Co., Schenectady, N. Y.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Forging)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Galvanizing)
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Gas or Oil)
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Heat Treating, Annealing, Carburizing, Hardening, Tempering)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Carborundum Co., The, Perth Amboy, N. J.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Greenfield, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Industrial)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Hagan Corp., 300 Ross St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

FURNACES (Laboratory)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hevi Duty Electric Co., 4100 W. Highland Blvd., Milwaukee, Wis.

FURNACES (Non-Ferrous Melting)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.

FURNACES (Open Hearth)
Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Lindemuth, Lewis B., 134 E. 47th St., New York City.

FURNACES (Recuperative)
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Rivet Heating)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
American Gas Furnace Co., Elizabeth, N. J.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Salem Engineering Co., Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

FURNACES (Sheet and Tin Mill)
Aetna-Standard Engineering Co., The, Youngstown, O.
Electric Furnace Co., The, Salem, O.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wean Engineering Co., Warren, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNACES (Steel Mill)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Electric Furnace Co., The, Salem, O.
General Electric Co., Schenectady, N. Y.
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.
Salem Engineering Co., 714 So. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.
Wilson, Lee, Engineering Co., 1370 Blount St., Cleveland, O.

FURNITURE (Tubular Steel)
Wallace Supplies Mfg. Co., 1304 Diversey Parkway, Chicago, Ill.

GAGES
Greenfield Tap & Die Corp., Greenfield, Mass.

GALVANIZING (Hot Dip)
Acme Galvanizing, Inc., Milwaukee, Wis.
Acme Steel & Malleable Iron Works, Buffalo, N. Y.
American Hot Dip Galvanizers Asso., Inc., 903 American Bank Bldg., Pittsburgh, Pa.
American Tinning & Galvanizing Co., Erie, Pa.
Buffalo Galvanizing & Tinning Works, Inc., Buffalo, N. Y.
Cattie, Jos. P., & Bros., Gaul and Liberty Sts., Philadelphia, Pa.

GALVANIZING (Hot Dip)—Con.
Chain Products Co., The, Cleveland, O.
Diamond Expansion Bolt Co., Inc., Garwood, N. J.
Enterprise Galvanizing Co., 2507 E. Cumberland St., Philadelphia, Pa.
Thomas Gregory Galvanizing Works, Maspeth, N. Y.
Hanlon-Gregory Galvanizing Co., Pittsburgh, Pa.
Joslyn Mfg. & Supply Co., Chicago, Ill.
Koven, L. O., & Bro., Inc., Jersey City, N. J.
Lehigh Structural Steel Co., Allentown, Pa.
Missouri Rolling Mill Corp., St. Louis, Mo.
National Telephone Supply Co., The, Cleveland, O.
Penn Galvanizing Co., Philadelphia, Pa.
Riverside Foundry & Galvanizing Co., Kalamazoo, Mich.
Standard Galvanizing Co., Chicago, Ill.
Wilcox, Crittenden & Co., Inc., Middletown, Conn.
Witt Cornice Co., The, Cincinnati, O.

GALVANIZING PLANTS FOR SHEETS
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Wean Engineering Co., Warren, O.

GAS (Detarring)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GAS HOLDERS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

GAS PRODUCERS PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

GAS RECOVERY COKE OVEN AND GAS PLANTS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

GAS SCRUBBERS
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Brassert, H. A., & Co., 310 So. Michigan Ave., Chicago, Ill.
Peabody Engineering Corp., 580 Fifth Ave., New York City.
Research Corp., 405 Lexington Ave., New York City.
Western Gas Div., Koppers Co., Fort Wayne, Ind.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

GASKETS (Asbestos, Metal or Rubber)
American Hard Rubber Co., 11 Mercer St., New York City.
Johns-Manville Corp., 22 E. 40th St., New York City.

GAGES (Draft)
Peabody Engineering Corp., 580 Fifth Ave., New York City.

GAUGES (Indicating and Recording)
General Electric Co., Schenectady, N. Y.

GEAR BLANKS
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
National-Erie Corp., Erie, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.
Waldron, John, Corp., New Brunswick, N. J.

GEAR MACHINERY (Generating)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.

GEAR MACHINERY (Lapping, Finishing, Checking)
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

GEARS (Non-Metallic)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

GEARS (Spur, Bevel, Miter)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS (Steel Laminated)
Waldron, John, Corp., New Brunswick, N. J.

GEARS (Worm)
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, O.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.

GEARS AND GEAR CUTTING
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., 2501 Liberty Ave., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

GENERATING SETS
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.

GENERATORS (Acetylene—Portable and Stationary)
Linde Air Products Co., The, 30 E. 42nd St., New York City.

GENERATORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 122 W. 22nd St., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GRABS — FOR SHEETS, COILS, INGOTS
J-B Engineering Sales Co., New Haven, Conn.

GRATING
Blaw-Knox Co., Blawnox, Pa.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

GREASE (Lubricating—See LUBRICANTS (Industrial)

GREASE RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill

GRINDERS (Pedestal, High Speed)
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles Cal.

GRINDERS (Portable—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

GRINDERS (Precision Thread)
Jones & Lamson Machine Co., Springfield, Vt.

GRINDERS (Single Slide Internal)
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDERS (Surface)
Heald Machine Co., Worcester, Mass.

GRINDING COMPOUNDS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.

GRINDING MACHINES (Automotive Reconditioning)
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Centerless, Internal and External)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Chucking)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Heald Machine Co., Worcester, Mass.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Crank Pin, Cam, Piston, Valve Face)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Oscillating)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Company, Waynesboro, Pa.

GRINDING MACHINES (Plain and Universal)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Roll)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Landis Tool Co., Waynesboro, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Norton Co., Worcester, Mass.

GRINDING MACHINES (Rotary Surface)
Blanchard Machine Co., Cambridge, Mass.
Heald Machine Co., Worcester, Mass.

GRINDING MACHINES (Swing Frame)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

GRINDING MACHINES (Tool and Cutter)
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING WHEELS
Abrasive Co., Taconey & Fraley Sts., Philadelphia, Pa.
Blanchard Machine Co., Cambridge, Mass.
Carborundum Co., The, Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

GRINDING WHEELS (Segment)
Blanchard Machine Co., Cambridge, Mass.

GUIDE SHOES
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

GUIDES (Mill)
National-Erie Corp., Erie, Pa.

GUNS (Blast Furnace Mud)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

GUNS (Steam, Hydraulic, Electric)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

HACK SAWS
Simonds Saw & Steel Co., Fitchburg, Mass.

HAMMERS (Chipping, Riveting, Calking)
Ingersoll-Rand Co., 11 Broadway, New York City.

HAMMERS (Drop)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HAMMERS (Steam)
Alliance Machine Co., The, Alliance, O.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Industrial Brownhoist Corp., Bay City, Mich.
Morgan Engineering Co., The, Alliance, O.

HANGERS
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HANGERS (Shaft)
Bantam Bearings Corp., South Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Division, General Motors Corp., Harrison, N. J.
New Departure Div., General Motors Corp., Bristol, Conn.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

HARDENING—See Case HARDENING

HARDWARE SPECIALTIES
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Peoria Malleable Castings Co., Peoria, Ill.

HEAT TREATING MATERIALS
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Sauereisen Cements Co., Sharpsburg Sta., Pittsburgh, Pa.

HEATERS (Air)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

Heaters (Oven)
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.

HEATERS (Unit)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

HITCHINGS (Mine Car)
American Chain & Cable Co., Bridgeport, Conn.

HOBBING MACHINES
Barber Colman Co., 150 Loomis St., Rockford, Ill.

HOBS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

HOISTS (Chain)
Ford Chain Block Div. of American Chain & Cable Co., Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa. Cleveland, O., Dept. 20-9.

HOISTS (Electric)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Industrial Brownhoist Corp., Bay City, Mich.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Monorail)
American Engineering Co., 2484 Aramingo Ave., Philadelphia, Pa.
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 406 Broadway, Muskegon, Mich.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

HOISTS (Pneumatic)
Curtis Pneumatic Machinery Co., 1996 Kienlen Ave., St. Louis, Mo.
Ingersoll-Rand Co., 11 Broadway, New York City.

HOOKS (Chain)
American Chain & Cable Co., Bridgeport, Conn.

HOOPS AND BANDS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell St., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

HOSE (Flexible Metallic)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

HOSE (Rubber)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

HYDRAULIC MACHINERY
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

HYDRAULIC PRESSES—See PRESSES (Hydraulic)

INDICATORS (Temperature)
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INDICATORS (Blast Furnace Stock Line)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

INGOT MOLDS
Bethlehem Steel Co., Bethlehem, Pa.
Shenango-Penn Mold Co., Oliver Bldg., Pittsburgh, Pa.
Valley Mould & Iron Co., Hubbard, O.

INGOT PIPE ELIMINATORS
Alpha-Lux Co., 192 Front St., New York City.

INHIBITORS
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.

INJECTORS (Lead)
Dietzel Lead Burning Co., Coraopolis, Pa.

INSTRUMENTS (Electric Indicating and Recording)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

INSULATING BLOCK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING BRICK
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

INSULATING POWDER AND CEMENT
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Armstrong Cork Products Co., Lancaster, Pa.
Babcock & Wilcox Co., The, 19 Rector St., New York City.

INSULATION (Furnace, Boiler Settings, Ovens, Steam Pipe, Etc.)
Armstrong Cork Products Co., Lancaster, Pa.
Johns-Manville Corp., 22 E. 40th St., New York City.

IRON (Bar)
Ryerson, Jos. T., & Son Co., 16th & Rockwell Sts., Chicago, Ill.

IRON ORE
Alan Wood Steel Co., Conshohocken, Pa.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

JETS (Steam, for Pickling)
Bronze Die Casting Co., Franklin St. at Ohio River, Pittsburgh, Pa.

JIGS AND FIXTURES
Columbus Die, Tool & Mach. Co., 955 Cleveland Ave., Columbus, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.

KEYS (Machine)
Moltrup Steel Products Co., Beaver Falls, Pa.

KEYS (Woodruff)
Moltrup Steel Products Co., Beaver Falls, Pa.

KNIVES (Rotary)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cowles Tool Co., 2086 W. 110th St., Cleveland, O.

KNIVES (Shear, Solid Steel, Flying)
American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.

LABORATORY WARE
Norton Company, Worcester, Mass.

LACQUERS
Sipe, James B., & Co., Inc., So. Hills Branch, Pittsburgh, Pa.

LADLES
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

LAMPS (Filaments)
General Electric Co., Nela Park, Cleveland, O.

LAMPS (Mercury Vapor)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LAMPS (Neon Glow)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LAPPING MACHINES
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.

LARRIES (Coal)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

LATHES
LeBlond, R. K., Machine Tool Co., 2694 Madison Rd., Cincinnati, O.
Monarch Machine Tool Co., Sidney, O.

LATHES (Automatic)
Jones & Lamson Machine Co., Springfield, Vt.
Monarch Machine Tool Co., Sidney, O.

LATHES (Roll Turning)
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret)
Bullard Company, The, Bridgeport, Conn.
Jones & Lamson Machine Co., Springfield, Vt.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, O.

LATHES (Turret) (Automatic Vertical)
Bullard Company, The, Bridgeport, Conn.

LEAD (Chemical, Corroding, Desilvered)
St. Joseph Lead Co., 250 Park Ave., New York City.

LEAD (Tellurium)
National Lead Co., 111 Broadway, New York City.

LEAD WORK
Dietzel Lead Burning Co., Coraopolis, Pa.

LEVELING MACHINES
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
McKay Machine Co., Youngstown, O.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

LIGHT OIL RECOVERY & TREATMENT EQUIPMENT
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

LIFT TRUCKS—See TRUCKS (Lift)

LIFTING MAGNETS—See MAGNETS (Lifting)

LIGHTING (Industrial)
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

LINERS (Pump and Cylinder)
Shenango-Penn Mold Co., Dover, O.

LININGS—for Soaking Pits and Ladles
National Stone Co., Ellwood City, Pa.

LOCOMOTIVE CRANES—See CRANES (Locomotive)

LOCOMOTIVES (Diesel-Electric)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Diesel Mechanical)
Plymouth Locomotive Works, Plymouth, O.
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Electric Trolley)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Gasoline-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Gasoline Mechanical)
Whitcomb Locomotive Div., The Baldwin Locomotive Works, Paschall P. O., Philadelphia, Pa.

LOCOMOTIVES (Oil-Electric)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LOCOMOTIVES (Storage Battery)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
General Electric Co., Schenectady, N. Y.
Whitcomb Locomotive Division, The Baldwin Locomotive Works, Paschall P. O. Sta., Philadelphia, Pa.

LUBRICANTS (Industrial)
American Lanolin Corp., Railroad St., Lawrence, Mass.
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
New York & New Jersey Lubricant Co., 292 Madison Ave., New York City.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Socony Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

WHERE-TO-BUY

LUBRICATING SYSTEMS
Farval Corp.,
3270 E. 80th St., Cleveland, O.

MACHINE WORK
Budd, Edw. G., Mfg. Co.,
25th St. & Huntington Park Ave., Philadelphia, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Hyde Park Foundry & Machine Co., Hyde Park, Pa.
Lewis Foundry & Machine Co.,
P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.

MACHINERY (Second Hand)
Marr-Galbreath Machinery Co.,
53 Water St., Pittsburgh, Pa.
West Penn Machinery Co.,
1208 House Bldg., Pittsburgh, Pa.

MACHINERY (Special)
Alliance Machine Co., The, Alliance, O.
Allis-Chalmers Mfg. Co., The, Milwaukee, Wis.
Atlas Car & Mfg. Co., The,
1140 Ivanhoe Rd., Cleveland, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.
Cleveland Punch & Shear Works,
3917 St. Clair Ave., Cleveland, O.
Columbus Die, Tool & Mach. Co.,
955 Cleveland Ave., Columbus, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc.,
110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp.,
5301 S. Western Ave., Chicago, Ill.
Lewis Foundry & Machine Co.,
P. O. Box 1586, Pittsburgh, Pa.
Moline Tool Co., Moline, Ill.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Niagara Machine & Tool Works,
637 Northland Ave., Buffalo, N. Y.
Oil Well Supply Co., Dallas, Texas.
Shuster, F. B., Co., The, New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co.
First National Bank Bldg., Pittsburgh, Pa.

MAGNESIA (Electrically Fused)
Norton Co., Worcester, Mass.

MAGNETIC SEPARATORS—See SEPARATORS (Magnetic)

MAGNETS (Lifting)
Electric Controller & Mfg. Co.,
2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The,
5906 Maurice Ave., Cleveland, O.

MAGNETS (Separating)
Ohio Electric Mfg. Co., The,
5906 Maurice Ave., Cleveland, O.

MANGANESE METAL AND ALLOYS
Electro Metallurgical Sales Corp.,
30 E. 42nd St., New York City.

MANGANESE ORE
Samuel, Frank, Co., Inc.,
Harrison Bldg., Philadelphia, Pa.

MANIPULATORS
Alliance Machine Co., The, Alliance, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind
Morgan Engineering Co., The, Alliance, O.

MARKERS (Industrial)
Helmer-Staley, Inc.,
325 W. Huron St., Chicago, Ill.

MARKING DEVICES
Helmer-Staley, Inc.,
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METAL (Perforated)—See PERFORATED METAL

METAL BLAST ABRASIVES (Shot and Grit)
Pittsburgh Crushed Steel Co.,
61st St. and A. V. R. R.,
Pittsburgh, Pa.

METAL CLEANERS
American Chemical Paint Co., Ambler, Pa.
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Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

METAL SPECIALTIES AND PARTS—See STAMPINGS

METAL STAMPINGS—See STAMPINGS

METALS (Nonferrous)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence, R. I.

MILLING MACHINES
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley Sta., Cincinnati, O.
Kearney & Trecker Corp., 5926 National Ave., Milwaukee, Wis.

MILLING MACHINES (Milling and Centering Combined)
Jones & Lamson Machine Co., Springfield, Vt.

MILLS (Blooming, Universal, Plate, Sheet, Tin, Bar, Strip, Etc.)—See ROLLING MILL EQUIPMENT

MOLDS (Ingot)—See INGOT MOLDS

MOLYBDENUM
Climax Molybdenum Co.,
500 Fifth Ave., New York City.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

MONEL METAL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

MONORAIL SYSTEMS
American MonoRail Co., The,
13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

MOTORS (Electric)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Chicago Electric Co., 1332 W. 22nd St., Chicago, Ill.
Fairbanks, Morse & Co.,
600 So. Wabash Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Reliance Electric & Mfg. Co., 1088 Ivanhoe Rd., Cleveland, O.
Sawyer Electrical Mfg. Co., 5715 Leneve St., Los Angeles, Cal.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

MUCK BAR
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

NAILS (*Also Stainless)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

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Detroit, 6339 Palmer Ave., E. • Canadian Branch, Walkerville, Ont.

NAILS—Con.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

NAILS (Coated and Galvanized)
Wickwire Brothers, 189 Main St., Cortland, N. Y.

NICKEL (All Commercial Forms)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL (Shot)
International Nickel Co., Inc., The, 67 Wall St., New York City.

NICKEL STEEL (Cold Drawn)
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Republic Steel Co., Dept. ST, Cleveland, O.
Union Drawn Steel Co., Massillon, O.

NUTS (*Also Stainless)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap & Screw Co., 2935 E. 79th St., Cleveland, O.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bo[illegible] & Nut Co., Port Chester, N.
Tinnerman Stove & Range Co., 2039 Fulton Rd., Cleveland, O.

NUTS (Castellated)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Colt Rd., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Cold Punched)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Hot Pressed)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Semi-Finished)
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

NUTS (Wing)
Parker-Kalon Corp., 200 Varick St., New York City.

OIL RETAINERS AND SEALS
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.

OILS (Cutting)
Gulf Oil Corp. of Penna., Gulf Refining Co., 3800 Gulf Bldg., Pittsburgh, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Penola, Inc., 34th & Smallman Sts., Pittsburgh, Pa.
Pure Oil Co., The, 35 E. Wacker Dr., Chicago, Ill.
Shell Oil Co., Inc., 50 W. 50th St., New York City.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.
Socony-Vacuum Oil Co., Inc., 26 Broadway, New York City.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Tide Water Associated Oil Co., 17 Battery Place, New York City.

OILS (Drawing)
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

OILS (Lubricating)—See LUBRICANTS (Industrial)

OILS (Paint)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OILS (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

OPEN-HEARTH FURNACES—See FURNACES (Open-Hearth)

OVENS (Annealing, Japanning, Tempering)
Hagan, Geo. J., Co., 2400 E. Carson St., Pittsburgh, Pa.
Maehler, Paul, Co., The, 2210 W. Lake St., Chicago, Ill.
Stewart Furnace Div., Chicago Flexible Shaft Co., 1106 So. Central Ave., Chicago, Ill.

OVENS (Coke, By-Product Recovery)
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.

OVENS (Core and Mold)
Maehler, Paul, & Co., The, 2210 W. Lake St., Chicago, Ill.
Pennsylvania Industrial Engineers, 2413 W. Magnolia St., Pittsburgh, Pa.

OXY-ACETYLENE WELDING AND CUTTING—See WELDING

OXYGEN IN CYLINDERS
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

PACKING (Asbestos or Rubber)
Goodyear Tire & Rubber Co., Akron, O.
Johns-Manville Corp., 22 E. 40th St., New York City.
United States Rubber Co., 1790 Broadway, New York City.

PACKINGS—MECHANICAL LEATHER (Cup, U-Cup, Flange and Vees)
Chicago Rawhide Mfg. Co., 1308 Elston Ave., Chicago, Ill.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.

PAINT (Alkali Resisting)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Aluminum)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Heat Resisting)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Industrial)
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Marking)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Pretreatment)
American Chemical Paint Co., Ambler, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Rust Preventive)
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.
Sipe, James B., & Co. Inc., So. Hills Branch, Pittsburgh, Pa.

PAINT (Stick Form)
Helmer-Staley, Inc., 325 W. Huron St., Chicago, Ill.

PERFORATED METAL
Chicago Perforating Co., 2443 W. 24th Pl., Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

PHENOL RECOVERY PLANTS
Koppers Co., Engineering and Construction Div., Pittsburgh, Pa.
Wilputte Coke Oven Corp., 570 Lexington Ave., New York City.

PICKLING COMPOUND
American Chemical Paint Co., Ambler, Pa.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Parkin, Wm. M., Co., The, 1005 Highland Bldg., Pittsburgh, Pa.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

PICKLING EQUIPMENT
International Nickel Co., Inc., The, 67 Wall St., New York City.

PICKLING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Erie Foundry Co., Erie, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

PICKLING TANK LININGS
American Hard Rubber Co., 11 Mercer St., New York City.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa

PICKLING TANKS—See TANKS (Pickling)

PIERCER POINTS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIG IRON
Alan Wood Steel Co., Conshohocken, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Brooke, E. & G., Iron Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
Hanna Furnace Corp., The, Ecorse, Detroit, Mich.
Jackson Iron & Steel Co., Jackson, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Samuel, Frank & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Shenango Furnace Co., Oliver Bldg., Pittsburgh, Pa.
Snyder, W. P., & Co., Oliver Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

PILING (Iron and Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 South Dearborn St., Chicago, Ill.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Co., Dept. ST, Cleveland, O.

PILING (Pressure-Treated Wood)
Wood Preserving Corp., The, Koppers Bldg., Pittsburgh, Pa.

PILLOW BLOCKS (Ball)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.

PILLOW BLOCKS (Roller Bearing)
Ahlberg Bearing Co., 3025 W. 47th St., Chicago, Ill.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis, Ind.
Shafer Bearing Corp., 35 E. Wacker Drive, Chicago, Ill.

PILLOW BOXES
SKF Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa.

PINIONS (Mill)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn.
344 Vulcan St., Buffalo, N. Y.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Simonds Gear & Mfg. Co., The, 2501 Liberty St., Pittsburgh, Pa.
United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.

PINS (Taper)
Moltrup Steel Products Co., Beaver Falls, Pa.

PIPE (Brass, Bronze, Copper—Rubber or Rubber Lined)
American Hard Rubber Co., 11 Mercer St., New York City.

PIPE (Brass, Bronze, Copper)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.
Shenango-Penn Mold Co., Dover, O.

PIPE (New and Used)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

PIPE (Square and Rectangular)
Youngstown Sheet & Tube Co., Youngstown, O.

PIPE (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PIPE BALLS
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

PIPE BENDING
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.

PIPE CUTTING AND THREADING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Landis Machine Co., Inc., Waynesboro, Pa.

PIPE ELIMINATORS
Alpha-Lux Co., Inc., 192 Front St., New York City.

PIPE FITTINGS
American Hard Rubber Co., 11 Mercer St., New York City.
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Crane Co., The, 836 So. Michigan Blvd., Chicago, Ill.
Oil Well Supply Co., Dallas, Texas.
Worthington Pump & Machy. Corp., Harrison, N. J.

PIPE LINES (Riveted and Welded)
Bethlehem Steel Co., Bethlehem, Pa.

PIPE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE STRAIGHTENING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Sutton Engineering Co., McKees Rocks, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

PIPING CONTRACTORS
Power Piping Co., Beaver and Western Ave., Pittsburgh, Pa.

PISTON RINGS
American Hammered Piston Ring Div., The Koppers Co., Baltimore, Md.

PISTON RODS
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Heppenstall Co., 47th and Hatfield Sts., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.

PLANERS AND SHAPERS
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.

PLATE CASTORS
Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

PLATES (Sheared or Universal)
(*Also Stainless)
*Alan Wood Steel Co., Conshohocken, Pa.
*Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., Middletown, O.
*Bethlehem Steel Co., Bethlehem, Pa.
*Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago Ill.
Jessop Steel Co., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Worth Steel Co., Claymont, Del.
Youngstown Sheet & Tube Co., The, Youngstown, O.

PLATES (Stainless Clad)
Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., Washington, Pa.

PLATES (Steel—Floor)—See FLOORING (Steel)

PLATES (Terne and Tin)—See TIN PLATE

PLUGS (Expansion)
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.

PLUGS (Rolling Mill)
Youngstown Alloy Casting Corp., 103 E. Indianola Ave., Youngstown, O.

POLES (Tubular Steel)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

POLISHING MACHINERY (Tube and Bar)
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.

POLISHING MACHINES, AUTOMATIC (Stainless Steel)
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.

POTS (Case Hardening)
Pressed Steel Tank Co., Milwaukee, Wis.

POTS (Melting)
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.

POWER UNITS (Gasoline, Electric for Industrial Trucks)
Ready Power Co., 3818 Grand River Ave., Detroit, Mich.

PRECIPITATORS (Cottrell Electric)
Research Corp., 405 Lexington Ave., New York City.
Western Precipitation Corp., 1016 W. 9th St., Los Angeles, Calif.

PREHEATERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRESSED METAL PARTS
Stanley Works, The, Pressed Metal Div., New Britain, Conn.

PRESSES
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.

PRESSES (Forging)
Erie Foundry Co., Erie, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PRESSES (Forming and Braking)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.

PRESSES (Hydraulic)
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Chambersburg Engineering Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
National-Erie Corp., Erie, Pa.
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

PRESSES (Punching, Drawing, Coining, Blanking, etc.)
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y.

PRESSES (Riveting)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

PRESSES (Scrap Bundling and Baling)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.

PRESSES (Welding)—See WELDERS

PRESSURE VESSELS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

PRODUCER GAS SYSTEMS—See GAS PRODUCER PLANTS

PUG MILLS (For Blast Furnaces and Sintering Plants)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.

PULVERIZERS
American Pulverizer Co., 1249 Macklind Ave., St. Louis, Mo.

PUMP HOUSES
Dravo Corp. (Contracting Div.), Neville Island, Pittsburgh, Pa.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Oil Well Supply Co., Dallas, Texas.

PUMPS (Boiler Feed)
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Centrifugal)
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Hard Rubber Co., 11 Mercer St., New York City.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Ingersoll-Rand Co., 11 Broadway, New York City.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Hydraulic)
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUMPS (Rotary)
Roper, Geo. D., Co., Rockford, Ill.

PUMPS (Vacuum)
Ingersoll-Rand Co., 11 Broadway, New York City.
Worthington Pump & Machinery Corp., Harrison, N. J.

PUNCHES (Multiple)
Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.

PUNCHING AND SHEARING MACHINERY
Beatty Machine & Mfg. Co., Hammond, Ind.
Chambersburg Engineering Co., Chambersburg, Pa.
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co. E. Chicago, Ind.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

PYROMETER TUBES
Norton Company, Worcester, Mass.

PYROMETERS
American Gas Furnace Co., Elizabeth, N. J.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

RAIL BREAKERS
National Roll & Foundry Co., The, Avonmore, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

RAILS (New and Relaying)
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

RAILS (Steel)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

REAMERS
Barber Colman Co., 150 Loomis St., Rockford, Ill.
Blanchard Machine Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

REAMERS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REAMERS (Sand, Ingot Mold—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

REBUILT EQUIPMENT
Marr-Galbreath Machinery Co., 53 Water St., Pittsburgh, Pa.
West Penn Machinery Co., 1208 House Bldg., Pittsburgh, Pa

RECEIVERS
Pressed Steel Tank Co., Milwaukee, Wis.

RECORDERS (Combustion)
Hays Corp., The, 960 Eighth Ave., Michigan City, Ind.

RECORDERS (Pressure, Speed, Temperature, Time)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REDUCERS (Speed)—See SPEED REDUCERS

REDUCTION GEARS
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
National-Erie Corp., Erie, Pa.
Sturtevant, B. F., Co., Hyde Park, Boston, Mass.

REFRACTORIES (Fire Clay)
Babcock & Wilcox Co., The, 19 Rector St., New York City.
Eureka Fire Brick Co., 1100 B. F Jones Law Bldg., Pittsburgh, Pa.
Keagler Brick Co., 1443 W. Market St., Steubenville, O.

REFRACTORIES (For High Frequency Furnaces)
Ajax Electrothermic Corp., Ajax Park, Trenton, N. J.
Carborundum Co., The, Perth Amboy, N. J.

REFRACTORIES (High Temperature)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silica)
Alpha-Lux Co., Inc., 192 Front St., New York City.

REFRACTORIES (Silicon Carbide)
Carborundum Co., The, Perth Amboy, N. J.
Norton Co., Worcester, Mass.

REGULATORS (Pressure)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

REGULATORS (Temperature)
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

REINFORCEMENT FABRIC (Electric Welded)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Wickwire Spencer Steel Co., 41 E. 42nd St., New York City.

RESISTORS (Edgewound)
Clark Controller Co., The, 1146 E. 152nd St., Cleveland, O.

RESISTORS (Graphite Disc)
Allen-Bradley Co., 1326 So. 2nd St., Milwaukee, Wis.

RHEOSTATS (Plating)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

RINGS (Steel)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bay City Forge Co., W. 19th and Cranberry Sts., Erie, Pa.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.
Kropp Forge Co., 5301 W. Roosevelt Blvd., Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RINGS (Welded Steel)
King Fifth Wheel Co., 5027 Beaumont Ave., Philadelphia, Pa.

RINGS (Weldless) (*Also Stainless)
*Midvale Co., The, Nicetown, Philadelphia, Pa.
*Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RIVETERS (Hydraulic—Portable and Stationary)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETERS (Jam, Pedestal, Staybolt, Squeeze, Stationary, Yoke—Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

RIVETERS (Pneumatic)
Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

RIVETING MACHINERY
Chambersburg Engineering Co., Chambersburg, Pa.
Shuster, F. B., Co., The, New Haven, Conn.
Tomkins-Johnson Co., 611 N. Mechanics St., Jackson, Mich.
Wood, R. D., Co., 400 Chestnut St., Philadelphia, Pa.

RIVETS (*Also Stainless)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
*Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
*Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, Pa.

RODS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

RODS (Drill)
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Kidd Drawn Steel Co., Aliquippa, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.

RODS (Piston)
Vulcan Steam Forging Co., 220-250 Rano St., Buffalo, N. Y.

RODS (Rounds, Flats and Shapes) (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. St., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Titan Metal Mfg. Co., Bellefonte, Pa.
Washburn Wire Co., Phillipsdale, R. I.
Youngstown Sheet & Tube Co., Youngstown, O.

RODS (Steel and Iron)
Firth-Sterling Steel Co., McKeesport, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.

RODS (Welding)—See WELDING RODS

RODS (Wire)—See WIRE PRODUCTS

ROLL COOLERS (Internal, Water)
Hunt, C. B., & Son, Salem, O.

ROLLER LEVELERS (Backed-up)
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

ROLLERS (Rubber)
Goodyear Tire & Rubber Co., Akron, O.

ROLLING DOORS & SHUTTERS—SEE DOORS & SHUTTERS

ROLLING MILL BEARINGS—See BEARINGS (Rolling Mill)

ROLLING MILL EQUIPMENT
Aetna Standard Engineering Co., The, Youngstown, O.
Alliance Machine Co., The, Alliance, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
Morgan Engineering Co., The, Alliance, O.
National Roll & Foundry Co., The, Avonmore, Pa.
Schloemann Engineering Corp. Empire Bldg., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.
Wean Engineering Co., Warren, O.

ROLLING MILLS (Consulting Contracting Engineers)
Schloemann Engineering Corp., Empire Bldg., Pittsburgh, Pa.

ROLLS (Sand and Chilled)
Aetna-Standard Engineering Co., The, Youngstown, O.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
National Roll & Foundry Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROLLS (Steel and Iron)
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mach. Co., Birdsboro, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.
Mesta Machine Co., P. O. Box 1466, Pittsburgh, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Roll & Fdry. Co., The, Avonmore, Pa.
Ohio Steel Fdry. Co., Lima, O.
Pittsburgh Rolls Corp., 41st and Willow Sts., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

ROOFING AND SIDING (Corrugated and Plain)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Sons, Inc., 16th and Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

ROOFING (Plastic and Liquid)
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUBBER GOODS (Mechanical)
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

RUST PREVENTIVES
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Railroad St., Lawrence, Mass.
Dearborn Chemical Co., 310 S. Michigan Ave., Chicago, Ill.
Houghton, E. F., & Co., 240 W. Somerset St., Philadelphia, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

RUST PROOFING PROCESS
American Chemical Paint Co., Ambler, Pa.
Koppers Co., Tar & Chemical Div., Pittsburgh, Pa.

SAFE ENDS (Boiler Tube)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

SAFETY DEVICES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

SALT TABLETS
Morton Salt Co., 208 W. Washington St., Chicago, Ill.

SAND CONDITIONING AND PREPARING MACHINERY
Link-Belt Co., 300 W. Pershing Rd., Chicago, Ill.

SAWS (Hot and Cold)
Morgan Engineering Co., The, Alliance, O.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SAWS (Inserted Tooth, Cold)
Simonds Saw & Steel Co., Fitchburg, Mass.

SAWS (Metal Cutting)
Simonds Saw & Steel Co., Fitchburg, Mass.
Youngstown Sheet & Tube Co., Youngstown, O.

SCAFFOLDING (Tubular)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

SCALES
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Dial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Fairbanks, Morse & Co., 600 So. Wabash Ave., Chicago, Ill.
Kron Co., The, Bridgeport, Conn.

SCALES (Monorail)
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Kron Co., The, Bridgeport, Conn.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

SCALING TOOLS (Pneumatic)
Ingersoll-Rand Co., 11 Broadway, New York City.

SCRAP BALING PRESSES—See BALING PRESSES

SCREENS AND SIEVES
Chicago Perforating Co., 2443 W. 24th Pl. Chicago, Ill.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.
Koppers Co., Engineering & Construction Div., Pittsburgh, Pa.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SCREW EXTRACTORS
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW MACHINE PRODUCTS
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Hindley Mfg. Co., Valley Falls, R. I.
National Acme Co., The E. 131st St. & Coit Rd., Cleveland, O.
Progressive Mfg. Co., Torrington, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa.

SCREW MACHINES (Automatic, Single and Multiple Spindle)
Brown & Sharpe Mfg. Co., Providence, R. I.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

SCREW PLATES
Greenfield Tap & Die Corp., Greenfield, Mass.

SCREW STOCK—See STEEL (Screw Stock)

SCREWS
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
Parker-Kalon Corp., 200 Varick St., New York City.
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Cap, Set, Safety-Set)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Cold Headed)
Cleveland Cap Screw Co., 2935 E. 79th St., Cleveland, O.

SCREWS (Conveyor)
Lee Spring Co. Inc., 30 Main St., Brooklyn, N. Y.

SCREWS (Drive)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Hardened Self-Tapping)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Machine)
Progressive Mfg. Co., Torrington, Conn.

SCREWS (Machine, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Parker-Kalon Corp., New York City.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.

WHERE-TO-BUY

SCREWS (Sheet Metal, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Parker-Kalon Corp., New York City.
Pheoll Mfg. Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

SCREWS (Socket, Cold Forged)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Socket, Head, Cap)
Standard Pressed Steel Co., Stewart Ave., & Kenmire St., Jenkintown, Pa.

SCREWS (Thumb)
Parker-Kalon Corp., 200 Varick St., New York City.

SCREWS (Wood, Recessed Head)
American Screw Co., Providence, R. I.
Chandler Products Co., Euclid, O.
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
Lamson & Sessions Co., The, Cleveland, O.
National Screw & Mfg. Co., Cleveland, O.
Pheoll Mfg. Co., Chicago, Ill.

SEAMLESS STEEL TUBING—See TUBES

SEPARATORS (Magnetic)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
Ohio Electric Mfg. Co., The, 5906 Maurice Ave., Cleveland, O.

SHAFT HANGERS—See HANGERS (Shaft)

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHAPERS

Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.

SHAPES (Brass, Bronze, Nickel Silver)

Titan Metal Mfg. Co., Bellefonte, Pa.

SHAPES (Steel)—See STEEL (Structural)

SHAPES, SPECIAL (Steel)

Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Pressed Steel Tank Co., Milwaukee, Wis.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

SHEAR BLADES

American Shear Knife Co., 3rd and Ann Sts., Homestead, Pa.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.

SHEARS

Aetna-Standard Engineering Co., The, Youngstown, O.
Beatty Machine & Mfg. Co., Hammond, Ind.
Cincinnati Shaper Co., Garrard and Elam Sts., Cincinnati, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Continental Roll & Steel Fdry. Co., E. Chicago, Ind.
Hallden Machine Co., The, Thomaston, Conn.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
Lewis Fdry. & Mach. Co., P. O. Box 1586, Pittsburgh, Pa.
Morgan Engineering Co., The, Alliance, O.
Niagara Machine & Tool Works, 637 Northland Ave., Buffalo, N. Y.
Thomas Machine Mfg. Co., Pittsburgh, Pa.
United Engineering & Fdry. Co., First National Bank Bldg., Pittsburgh, Pa.

SHEET BARS

Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEET LIFTERS AND CARRIERS

American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.
Hyde Park Fdry. & Mach. Co., Hyde Park, Pa.
J-B Engineering Sales Co., New Haven, Conn.

SHEET METAL PRODUCTS—See STAMPINGS

SHEET METAL WORKERS MACHINES

Cincinnati Shaper Co., Elam and Garrard Sts., Cincinnati, O.
Excelsior Tool & Machine Co., Ridge and Jefferson Aves., East St. Louis, Ill.
Niagara Machine & Tool Works 637 Northland Ave., Buffalo, N. Y.

SHEET STEEL ASSEMBLIES (Fabricated)

Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.

SHEET STEEL PILING (New and Used)

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.

SHEETS (Acid Resisting)

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SHEETS (Black)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

SHEETS (Brass, Bronze, Copper, Nickel Silver, Silicon-Bronze)
American Brass Co., The, 25 Broadway, New York City.
Bridgeport Brass Co., Bridgeport, Conn.

SHEETS (Corrugated)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Deep Drawing and Stamping)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Electrical)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Galvanized)
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Hot Rolled and Hot Rolled Annealed)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Long Terne)
Andrews Steel Co., The, Newport, Ky.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SHEETS (Perforated)
Harrington & King Perforating Co., 5634 Fillmore St., Chicago, Ill.

SHEETS (Reinforced)
Erdle Perforating Co., 171 York St., Rochester, N. Y.

SHEETS (Roofing)—See ROOFING AND SIDING

SHEETS (Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Jessop Steel Co., Washington, Pa.
Republic Steel Corp., Massillon, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.

SHEETS (Stainless Clad)
Granite City Steel Co., Granite City, Ill.

SHEETS (Tin)—See TIN PLATE

SHEETS (Tin Mill Black)
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

SHEETS—HIGH FINISH (Automobile, Metal Furniture, Enameling)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
Andrews Steel Co., The, Newport, Ky.
Apollo Steel Co., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., Youngstown, O.

SIEVES—See SCREENS AND SIEVES

SILICO-MANGANESE
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
Ohio Ferro-Alloys Corp., Citizens Bldg., Canton, O.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.
Vanadium Corp. of America, 420 Lexington Ave., New York City.

SILICON METAL AND ALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.

SKELP (Steel)
Alan Wood Steel Co., Conshohocken, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Inland Steel Co., 38 S. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

SLAG GRANULATING MACHINES (Blast Furnace and Open Hearth)
Brosius, Edgar E., Inc., Sharpsburg, Pa.

SMALL TOOLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.

SOAKING PITS
Amsler-Morton Co., Fulton Bldg., Pittsburgh, Pa.
Criswell, James, Co., Keenan Bldg., Pittsburgh, Pa.
Salem Engineering Co., 714 S. Broadway, Salem, O.
Surface Combustion Corp., 2375 Dorr St., Toledo, O.

SOLVENT (Degreasing)
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SPACING TABLES
Thomas Machine Mfg. Co., Pittsburgh, Pa.

SPECIAL MACHINERY—See MACHINERY (Special)

SPEED REDUCERS
Cleveland Worm & Gear Co. 3249 E. 80th St., Cleveland, O.
Farrel-Birmingham Co., Inc., 110 Main St., Ansonia, Conn. 344 Vulcan St., Buffalo, N. Y.
Foote Bros. Gear & Machine Corp., 5301 S. Western Ave., Chicago, Ill.
Grant Gear Works, 2nd and B Sts., Boston, Mass.
Horsburgh & Scott Co., The, 5114 Hamilton Ave., Cleveland, O.
James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.
Jones, W. A., Fdry. & Mach. Co., 4401 W. Roosevelt Rd., Chicago, Ill.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
New Departure Div., General Motors Corp., Bristol, Conn.

SPIEGELEISEN
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York City.
New Jersey Zinc Co., 160 Front St., New York City.
Samuel, Frank, & Co., Inc., Harrison Bldg., Philadelphia, Pa.

SPIKES (Screw)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

SPLICE BARS (Rail)
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

SPRINGS (*Also Stainless)
*American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Duer Spring & Mfg. Co., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Standard Steel Works Co., Paschall P. O., Philadelphia, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

SPRINGS (Alloy)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Coil and Elliptic)
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.

SPRINGS (Oil Tempered—Flat)
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.

SPROCKETS
Chain Belt Co., 1660 W. Bruce St., Milwaukee, Wis.

SPRUE CUTTERS
Shuster, F. B., Co., The, New Haven, Conn.

STACKS (Steel)—See BRIDGES, ETC.

STAINLESS STEEL—See BARS, SHEETS, STRIP, PLATES, ETC.

STAMPINGS
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Barnes, Wallace, Co., The, Div. Associated Spring Corp., Bristol, Conn.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Crosby Co., The, 183 Pratt St., Buffalo, N. Y.
Davis Brake Beam Co., Laurel Ave., & P. R. R., Johnstown, Pa.
Erdle Perforating Co., 171 York St., Rochester, N. Y.
Hubbard, M. D., Spring Co., 613 Central Ave., Pontiac, Mich.
Pressed Steel Tank Co., Milwaukee, Wis.
Raymond Mfg. Co., Div. Associated Spring Corp., Corry, Pa.
Stanley Works, The, New Britain, Conn.
Toledo Stamping & Mfg. Co., 99 Fearing Blvd., Toledo, O.
Whitehead Stamping Co., 1661 W. Lafayette Blvd., Detroit, Mich.

STAPLES (Wire)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Columbia Steel Co., San Francisco, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

STARTERS (Electric Motor)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.

STEEL (Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Heppenstall Co., 47th & Hatfield Sts., Pittsburgh, Pa.
Jessop Steel Co., Washington, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Simonds Saw & Mfg. Co., Fitchburg, Mass.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Timken Steel & Tube Co., Canton, O.
Washburn Wire Co., Phillipsdale, R. I.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Alloy, Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Clad—Corrosion Resisting) (*Also Stainless)
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
*Granite City Steel Co., Granite City, Ill.
Jessop Steel Co., Washington, Pa.
Superior Steel Corp., Carnegie, Pa.

STEEL (Cold Drawn)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co, McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Kidd Drawn Steel Co., Aliquippa, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Cold Finished)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Firth-Sterling Steel Co., McKeesport, Pa.
Fitzsimons Co., The, 1623 Wilson Ave., Youngstown, O.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Moltrup Steel Products Co., Beaver Falls, Pa.
Monarch Steel Co., McCarty and Sand Sts., Indianapolis, Ind.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.

STEEL (Corrosion Resisting)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop Steel Co., Washington, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Midvale Co., The, Nicetown, Philadelphia, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Timken Steel & Tube Co., Canton, O.

STEEL (Die)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.

STEEL (Drill)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.

STEEL (Electric)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Firth-Sterling Steel Co., McKeesport, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.
National Forge & Ordnance Co., Irvine, Warren Co., Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Timken Steel & Tube Co., Canton, O.

STEEL (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Latrobe Electric Steel Co., Latrobe, Pa.

STEEL (High Tensile, Low Alloy)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Nitriding)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL (Rustless)—See STEEL (Corrosion Resisting)

STEEL (Screw Stock)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss & Laughlin, Inc., Harvey, Ill.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
LaSalle Steel Co., P. O. Box 6800-A, Chicago, Ill.
Moltrup Steel Products Co., Beaver Falls, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Union Drawn Steel Co., Massillon, O.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Wyckoff Drawn Steel Co., First National Bank Bldg., Pittsburgh, Pa.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Spring)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Fort Pitt Spring Co., P. O. Box 1377, Pittsburgh, Pa.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Stainless)—See STEEL (Corrosion Resisting)

STEEL (Strip, Copper Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Thomas Steel Co., Warren, O.

STEEL (Strip, Hot and Cold Rolled) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*American Rolling Mill Co., The, Middletown, O.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
American Tube & Stamping Plant, (Stanley Wks.), Bridgeport, Conn.
Andrews Steel Co., The, Newport, Ky.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
*Firth-Sterling Steel Co., McKeesport, Pa.
Great Lakes Steel Corp., Ecorse, Detroit, Mich.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jessop, Wm., & Sons, Inc., 121 Varick St., New York City.
Jessop Steel Co., Washington, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Laclede Steel Co., Arcade Bldg., St. Louis, Mo.
Republic Steel Corp., Dept. ST, Cleveland, O.
*Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
*Stanley Works, The, New Britain, Conn. Bridgeport, Conn.
Superior Steel Corp., Carnegie, Pa.
Tennessee Coal, Iron & Railroad Co. Brown Marx Bldg., Birmingham, Ala.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.
Weirton Steel Co., Weirton, W. Va
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.

STEEL (Strip, Tin Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., The, Warren, O
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Strip, Zinc Coated)
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
Thomas Steel Co., Warren, O.
Washburn Wire Co., 118th St. & Harlem River, New York City.

STEEL (Structural) (*Also Stainless)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Belmont Iron Works, 22nd St. and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.
Wisconsin Steel Co., 180 No. Michigan Ave., Chicago, Ill.
Youngstown Sheet & Tube Co., The, Youngstown, O.

STEEL (Tool)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Darwin & Milner, Inc., 1260 W. 4th St., Cleveland, O.

STEEL (Tool)—Con.
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Jessop, Wm., & Sons Co., 121 Varick St., New York City.
Kidd Drawn Steel Co., Aliquippa, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Midvale Co., The, Nicetown, Philadelphia, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tennessee Coal, Iron & Railroad Co., Brown Marx Bldg., Birmingham, Ala.

STEEL BUILDINGS—See BRIDGES, BUILDINGS, ETC.

STEEL DOORS & SHUTTERS—See DOORS & SHUTTERS

STEEL FABRICATORS—See BRIDGES, BUILDINGS, ETC.

STEEL FLOATING AND TERMINAL EQUIPMENT
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

STEEL PLATE CONSTRUCTION
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Belmont Iron Works, 22nd St., and Washington Ave., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Federal Shipbuilding & Dry Dock Co., Kearney, N. J.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

STELLITE
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.

STOKERS
Babcock & Wilcox Co., The, 19 Rector St., New York City.

STOPPERS (Cinder Notch)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

STORAGE BATTERIES—See BATTERIES (Storage)

STRAIGHTENING MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Cleveland Punch & Shear Works, The, 3917 St. Clair Ave., Cleveland, O.
Lewis Foundry & Machine Co., P. O. Box 1586, Pittsburgh, Pa.
Lewis Machine Co., 3438 E. 76th St., Cleveland, O.
Logeman Brothers Co., 3126 Burleigh St., Milwaukee, Wis.
Medart Co., The, 3500 de Kalb St., St. Louis, Mo.
Shuster, F. B., Co., The, New Haven, Conn.
Sutton Engineering Co., Park Bldg., Pittsburgh, Pa.
Voss, Edward W., 2882 W. Liberty Ave., Pittsburgh, Pa.

SULPHURIC ACID
Cleveland-Cliffs Iron Co., Union Commerce Bldg., Cleveland, O.
New Jersey Zinc Co., 160 Front St., New York City.
Pennsylvania Salt Mfg. Co., 1000 Widener Bldg., Philadelphia, Pa.

SWITCHES (Electric)
Electric Controller & Mfg. Co., 2698 E. 79th St., Cleveland, O.
General Electric Co., Schenectady, N. Y.
General Electric Co., Lamp Dept., Nela Park, Cleveland, O.

TACHOMETERS
Brown Instrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

TANKS (Pickling)
American Hard Rubber Co., 11 Mercer St., New York City.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TANKS (Quenching, Automatic)
American Gas Furnace Co., Elizabeth, N. J.

TANKS (Storage, Pressure, Riveted, Welded)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Bethlehem Steel Co., Bethlehem, Pa.
Pressed Steel Tank Co., Milwaukee, Wis.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

TANKS—WOOD OR STEEL (Rubber or Lead Lined)
American Hard Rubber Co., 11 Mercer St., New York City.
Dietzel Lead Burning Co., Coraopolis, Pa.
Goodyear Tire & Rubber Co., Akron, O.
United States Rubber Co., 1790 Broadway, New York City.

TAPS AND DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Machine Co., Inc., Waynesboro, Pa.
National Acme Co., The, E. 131st St. & Coit Rd., Cleveland, O.

TERNE PLATE—See TIN PLATE

TESTING MACHINES (Moisture Tester)
Alpha-Lux Co., Inc., 192 Front St., New York City.

THERMOMETERS
Brown Isntrument Div. of Minneapolis Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia, Pa.
Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

THREAD CUTTING TOOLS
Landis Machine Co., Inc., Waynesboro, Pa.

TIE PLATES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Weirton Steel Co., Weirton, W. Va.

TIN PLATE
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Granite City Steel Co., Granite City, Ill.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Weirton Steel Co., Weirton, W. Va.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TIN PLATE MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.
Kemp, C. M., Mfg. Co., 405 E. Oliver St., Baltimore, Md.
Wean Engineering Co., Warren, O.

TITANIUM
Vanadium Corp. of America, 420 Lexington Ave., New York City.

TONGS (Rail Handling)
Cullen-Friestedt Co., 1308 Kilbourn Ave., Chicago, Ill.

TOOL BITS (High Speed)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TOOLS (Pneumatic)
Cleveland Punch & Shear Works, 3917 St. Clair Ave., Cleveland, O.
Ingersoll-Rand Co., 11 Broadway, New York City.

TOOLS (Precision, Lathe, Metal Cutting, etc.)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TOOLS (Tipped, Carbide)
McKenna Metals Co., 200 Lloyd Ave., Latrobe, Pa.

TORCHES AND BURNERS (Acetylene, Blow, Oxy-Acetylene)
Air Reduction Sales Co., 60 E. 42nd St., New York City.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.

TORCHES AND BURNERS (Air—Gas)
American Gas Furnace Co., Elizabeth, N. J.

TOWBOATS
Dravo Corp. (Engin'r'g Works Div.), Neville Island, Pittsburgh, Pa.

TOWERS (Transmission)
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.

TOWERS (Tubular Hoisting)
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.

TRACK ACCESSORIES
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Foster, L. B., Co., Inc., P. O. Box 1647, Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.

TRACK BOLTS
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Columbia Steel Co., San Francisco, Calif.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Upson Nut Div., Dept. ST, 1912 Scranton Rd., Cleveland, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Youngstown Sheet & Tube Co., Youngstown, O.

TRAILERS (Arch-Girder)
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRAMRAILS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRANSFORMERS
Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.

TRANSMISSIONS VARIABLE SPEED
Link-Belt Co., 220 S. Belmont Ave., Indianapolis, Ind.

TRAPS (Steam and Radiator)
Johns-Manville Corp., 22 E. 40th St., New York City.

TREADS (Safety)
Alan Wood Steel Co., Conshohocken, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh-Chicago.
Dravo Corp. (Machinery Div.), Neville Island, Pittsburgh, Pa.
Inland Steel Co., 38 So. Dearborn St., Chicago, Ill.
Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Tri-Lok Co., Neville Island, Pittsburgh, Pa.

TROLLEYS
American MonoRail Co., The, 13107 Athens Ave., Cleveland, O.
Ford Chain Block Div. American Chain & Cable Co. Inc., 2nd & Diamond Sts., Philadelphia, Pa.
Wright Mfg. Div. of American Chain & Cable Co. Inc., York, Pa.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa

TRUCKS AND TRACTORS (Electric Industrial)
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TRUCKS AND TRACTORS (Gasoline Industrial)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Dump-Industrial)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Hydraulic Lift)
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O.

TRUCKS (Lift)
Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.
Elwell-Parker Electric Co., The, 4501 St. Clair Ave., Cleveland, O.
Towmotor, Inc., 1247 E. 152nd St., Cleveland, O
Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa.

TUBE MILL EQUIPMENT
Mackintosh-Hemphill Co., 9th and Bingham Sts., Pittsburgh, Pa.

TUBE MILL MACHINERY
Aetna-Standard Engineering Co., The, Youngstown, O.

TUBES (Boiler)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.
Youngstown Sheet & Tube Co., The, Youngstown, O.

TUBES (Brass, Bronze, Copper, Nickel Silver)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.
Bridgeport Brass Co., Bridgeport, Conn.

TUBING (Alloy Steel) (*Also Stainless)
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
*Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
*National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Timken Steel & Tube Co., Canton, O.

TUBING (Cold Drawn Seamless Steel)
Babcock & Wilcox Tube Co., The, Beaver Falls, Pa.
Columbia Steel Co., San Francisco, Calif.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Ryerson, Jos. T., & Son, Inc., 16th & Rockwell Sts., Chicago, Ill.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Timken Steel & Tube Co., Canton, O.

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Bundy Tubing Co., 10951 Hern Ave., Detroit, Mich.
Shenango-Penn Mold Co., Dover, O.

TUBING (Phosphor Bronze)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Seamless Flexible Metal)
American Brass Co., The, American Metal Hose Branch, Waterbury, Conn.

TUBING (Welded Steel)
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Jones & Laughlin Steel Corp., Jones & Laughlin Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Standard Tube Co., The, 14600 Woodward Ave., Detroit, Mich.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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TUNGSTEN CARBIDE
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh, Pa.
Haynes Stellite Co., Harrison and Lindsay Sts., Kokomo, Ind.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.

TUNGSTEN CARBIDE (Tools and Dies)
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Vanadium Corp. of America, 420 Lexington Ave., New York City.

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General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

TURBO BLOWERS—See BLOWERS

TURNTABLES
American Bridge Co., Frick Bldg., Pittsburgh, Pa.
Atlas Car & Mfg. Co., The, 1140 Ivanhoe Rd., Cleveland, O.

TURRET LATHES—See LATHES (Turret)

TWIST DRILLS
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

VACUUM CLEANERS
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VALVES (Blast Furnace)
Bailey, Wm. M., Co., 702 Magee Bldg., Pittsburgh, Pa.
Brosius, Edgar E., Inc., Sharpsburg, Pa.

VALVES (Brass, Iron and Steel)
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Reading-Pratt & Cady Div. of American Steel & Wire Co. Inc., Bridgeport, Conn.

VALVES (Check)
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Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgeport, Conn.

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Hannifin Mfg. Co., 621-631 So. Kolmar Ave., Chicago, Ill.

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Foxboro Co., The, 118 Neponset Ave., Foxboro, Mass.

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Reading-Pratt & Cady Div. of American Chain & Cable Co. Inc., Bridgepart, Conn.
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Vanadium Corp. of America, 420 Lexington Ave., New York City.

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VISES (Bench)
Hollands Mfg. Co., 342-352 E. 18th St., Erie, Pa.

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Thompson-Gibb Electric Welding Co., Lynn, Mass.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

WELDING
Bartlett-Hayward Div., The Koppers Co., Baltimore, Md.
Budd, Edw. G., Mfg. Co., 25th St. & Huntington Park Ave., Philadelphia, Pa.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Western Gas Div., The Koppers Co., Fort Wayne, Ind.

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Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Thompson-Gibb Electric Welding Co., Lynn, Mass.
Wilson Welder & Metals Co., 60 E. 42nd St., New York City.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
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Linde Air Products Co., The, 30 E. 42nd St., New York City.
National Cylinder Gas Co., 205 W. Wacker Dr., Chicago, Ill.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

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Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
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Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.

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American Brass Co., The, 25 Broadway, New York City.
American Steel & Wire Co., Rockefeller Bldg., Cleveland, O.
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Champion Rivet Co., The, Harvard Ave. at E. 108th St., Cleveland, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee, Wis.
Lincoln Electric Co., The, Cleveland, O., Dept. 20-10.
Linde Air Products Co., The, 30 E. 42nd St., New York City.
Maurath, Inc., 7311 Union Ave., Cleveland, O.
Metal & Thermit Corp., 120 Broadway, New York City.
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Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
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Seneca Wire & Mfg. Co., Fostoria, O.
Washburn Wire Co., Phillipsdale, R. I.
Welding Equipment & Supply Co., 2720 E. Grand Blvd., Detroit, Mich.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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Youngstown Sheet & Tube Co., The, Youngstown, O.

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Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel Co., McKeesport, Pa.
*Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
*Republic Steel Corp., Dept. ST, Cleveland, O.
Ryerson, Jos. T., & Son, Inc., 16th and Rockwell Sts., Chicago, Ill.
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Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.

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Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
Wickwire Brothers, 189 Main St., Cortland, N. Y.
Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
Youngstown Sheet & Tube Co., The, Youngstown, O.

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Pittsburgh Steel Co., Grant Bldg., Pittsburgh, Pa.
Tennessee Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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Titan Metal Mfg. Co., Bellefonte, Pa.

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Republic Steel Corp., Dept. ST, Cleveland, O.
Seneca Wire & Mfg. Co., Fostoria, O.
Tennessee, Coal, Iron & Railroad Co., Brown-Marx Bldg., Birmingham, Ala.
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Wickwire Spencer Steel Co., 500 Fifth Ave., New York City.
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Page Steel & Wire Div. of American Chain & Cable Co., Inc., Monessen, Pa.
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Morgan Construction Co., Worcester, Mass.
Shuster, F. B., Co., The, New Haven, Conn.
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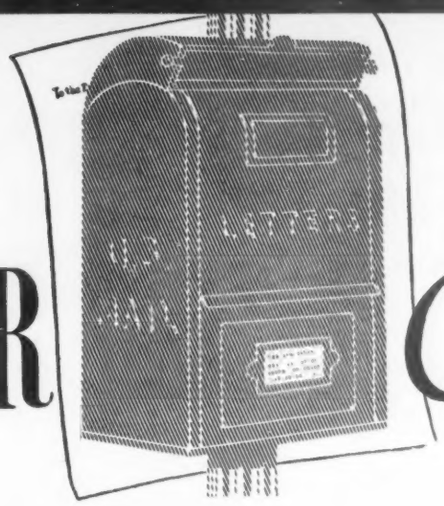

Readers are invited to comment upon articles, editorials, reports, prices or other editorial material appearing in STEEL. The editors cannot publish unsigned communications, but at their discretion may permit a writer to use a pseudonym when a bona fide reason exists for withholding his identity. Letters should be brief—preferably not exceeding 250 words.

Auto Strike Cuts Deeply

To the Editor:

"Forgotten men" in the current labor dispute in Detroit automobile plants, it seems to me, are the thousands of dealers and salesmen whose livelihood depends on selling cars they now are unable to obtain. With new models only recently introduced, dealers and salesmen might naturally expect a seasonal bulge in sales.

But what happens? At a time when plants should be running at capacity, production at Chrysler plant is disrupted by a slowdown. Apparently the only reason is the union's desire for a "show of strength."

Your Mr. Allen reports 54,000 production workers were thrown out of jobs (STEEL, Oct. 16, p. 41). But how about the men who earn their living distributing the new cars? Of the 45,000 car and truck dealers in the United States, it is fair to assume one-fourth handle Chrysler lines. If each dealership comprised only five men, as many in the distribution end would be deprived of income as are affected in the assembly plants.

These men have just as large an interest in new car production and distribution as the production workers, management or stockholders. When they are unable to obtain deliveries within a reasonable time, especially now, they lose their customers. Sales go to dealers who are able to make deliveries. Thus dealers and salesmen handling cars made in a plant which happens to be tied up by these new and peculiar union actions are placed at an unfair disadvantage.

It occurred to me tonight as I was looking at the new models and listening to the woes of dealers and salesmen that it would be a fine idea if that special congressional committee now investigating the labor board would also do some investigating of labor unions, especially in Detroit.

NEW CAR BUYER

Cincinnati

Industry Plays the Game

To the Editor:

Industry, despite many governmental efforts to throttle its spirit of enterprise during recent years, has evinced its determination to cooperate fully with the President and to concentrate on problems facing the nation. Industrial leaders throughout the nation have reaffirmed many times recently their full support of the government's stand on neutrality.

Instead of seeking to take advantage of abnormal sales opportunities which have arisen as a result of the war many manufacturers have expressed determination to supply domestic orders first. They have refused to contribute to general unease, are maintaining conditions as nearly normal as possible and have reiterated their sincere desire for the United States to stay out of war.

Many concerns have gone to considerable trouble and expense to forestall possible shortages of imported critical materials at the government's request. Provisions are being made that will enable the entire nation to assume a war-time economy in a fraction of the time necessary for the transformation during the World war, should such a step become imperative.

In spite of the emphasis which is, properly enough, placed upon preparedness, still greater emphasis is being placed, by business, upon a normal return to prosperity. That the present uptrend is not due solely to the war has been pointed out. As is always the case at such times, it results rather from a return of confidence on the part of the investor, who feels his money again can be safely put to work. Industry has done all in its power to stimulate confidence. It remains for the government to make possible the resurge of business required to place us again on prosperity levels.

There must be less government regimentation and distrust of business and its methods, more opportunity for enterprise, a greater feeling of security for the prospective investor, who will not finance new projects without some certainty of success.

INVESTOR

Boston

Wants No War Business

To the Editor:

We learned our lesson in the last war. Business was poor in 1914 and 1915 and when the allies were ready to place war munitions here we loaded up. After the war we had to explain to former peacetime customers why we had walked out on them. It was a lot harder to switch from war to peacetime business than it had been to switch from peacetime to war business. This time we are not going to make any switch. Unless we get into the war—and I can't see why we should—our company is going to sell wisely, with an eye to the future. That means no direct foreign war business for us.

SALES MANAGER

Pittsburgh

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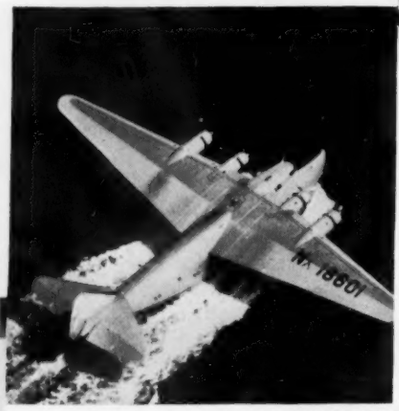

DESIGN ENGINEERS SEE SIMPLER FASTENINGS

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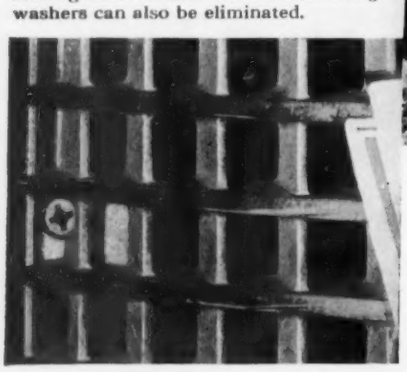

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